

MOTOR AGE

Vol. XXXIV
No. 2

PUBLISHED WEEKLY
CHICAGO, JULY 11, 1918

Ten cents a copy
Three dollars a year

STROM

BEARINGS

FORMERLY U.S. BALL BEARINGS

U. S. BALL BEARING
MANUFACTURING CO.

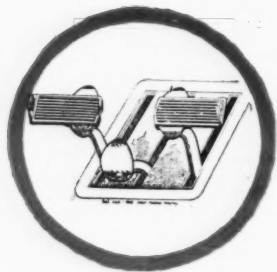
(Conrad Patent Licensee)

Palmer Street and Kolmar Avenue
CHICAGO :: :: ILLINOIS





THE THREE DOMINANT ACCESSORIES OF THE SEASON



UTILITY SURE-GRIP PEDALS FOR FORDS

PRICE ONLY

\$1.00 PER
PAIR

\$1.25 West of Rockies

Transforms the small, smooth Ford Clutch and Brake pedals into standard size, comfortable pedals. The driver's foot absolutely cannot slip off the pedal. The heavy rubber pad and flange at the side prevent all possibility of a slip, even in rainy weather when the shoes are wet.

The UTILITY Sure-Grip Pedals also serve to easily distinguish the clutch and brake pedals from the reverse.

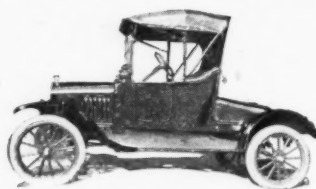
ONE DOLLAR PREVENTS ACCIDENTS

By installing these pedals on Fords, drivers can absolutely prevent accidents due to the foot slipping off the pedal.

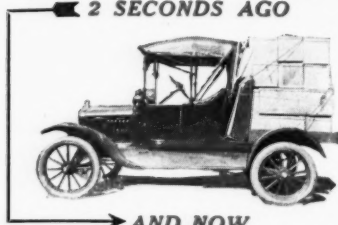
In crowded traffic a slip of the foot may mean jamming into a street car or the car ahead. One dollar will prevent this.

These pedals can be attached instantly—no holes to drill—no special tools required—one nut to tighten and the job is done. Made of high grade pressed steel beautifully finished in black baked enamel.

Absolutely guaranteed.



2 SECONDS AGO



AND NOW

UTILITY DISAPPEARING TRUCK FOR FORDS

Price \$32.50

Once the UTILITY Disappearing Truck is installed it requires only 2 seconds to change from a Ford roadster to a half ton truck. The truck is completely out of sight, telescoped under the original turtle back of the Ford. The car is not disfigured in any way—it looks just as it always did with no hints of the truck when it is not in use.

HAULS ANY HALF TON LOAD

Can be completely installed by anyone with a hammer and wrench in one hour. Only four bolts used in attaching it. No rattle—no vibration. Will haul any load up to a half ton.

Made of heavy gauge steel finished in black baked enamel to match finish of car. Can be pulled out to the desired length. No bolts or rivets are used in its construction. It is acetylene welded throughout.

Makes a Ford the most useful car on the market.



PRICE
\$1.50

UTILITY UNIVERSAL RIM WRENCH

ONE TOOL FITS EVERY NUT

The UTILITY Universal Rim Wrench is built in only one size—yet it automatically fits every nut on every demountable rim. In the tool box of the motorist, in the stock or the shop of the garage or repairman, it is small enough to be always out of the way—except when you need it. Then it is always ready for use—a single tool that fits, holds, and turns any nut.

ONE TOOL FOR EVERY NUT

The new UTILITY Universal Rim Wrench is beautifully finished in nickel and black enamel. It is more compact and lighter, and built with practically unbreakable jaws. It is shortened to go into the tool box without folding, and is absolutely rigid in action—a stronger brace that cannot close up or slip while in use by the operator.

DEALERS!

GET DETAILED INFORMATION CONCERNING "THE BIG THREE"

District Offices:

Kansas City, Rialto Bldg.
New York, 149 Church St.

Hill Pump Valve Co.

Archer Avenue and Canal Street
CHICAGO ILLINOIS

District Offices:

San Francisco, 149 New Montgomery St.
Seattle, L. C. Smith Bldg.





TIME 2:00



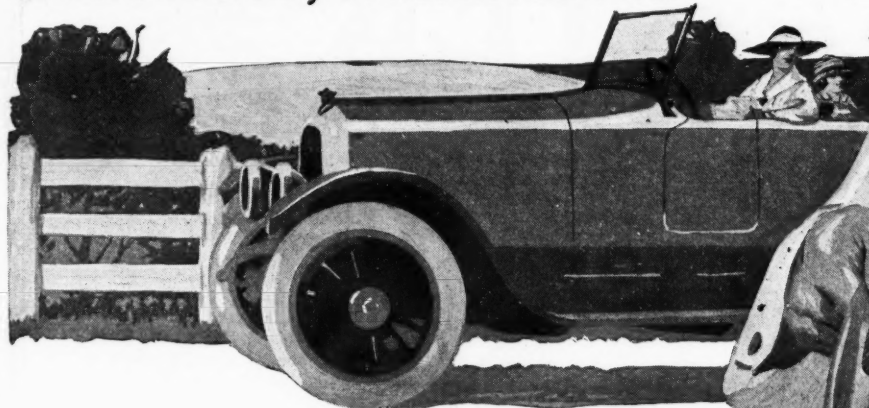
TIME 2:01



TIME 2:02

2:03

Patched and ready to use in 3 Minutes



JOHNSON'S Hastee Patch

Saves Time, Tires and Temper

WITH Johnson's Hastee Patch the most inexperienced motorist can satisfactorily and inexpensively repair his own tubes. No time, labor or heat required. The Patch can be applied in three minutes—at a cost of 2c—and it's so simple a child can use it.

Ready For Instant Use

With Johnson's Hastee Patch it takes but two or three minutes to make the repair and the tube can be pumped up immediately and is ready for instant use at any speed.

Better Than Vulcanizing

Johnson's Hastee Patch is much better than vulcanizing because there is no danger of burning and spoiling the tube. Johnson's Hastee Patch gives equally good results on a pin hole puncture or a large blow out. It is conveniently put up in strips so the user can cut just the right size patch for each repair.

Cut Down Your Tire Investment

If you'll carry a box of Johnson's Hastee Patch in your tool kit you can get away from the expense of a lot of spare tubes and casings which fast deteriorate during the hot motoring months. A box of Johnson's Hastee Patch in your car answers the same purpose as two or three extra tubes and casings, and there is a saving of 23c over garage vulcanizing on your smallest patch and much more on large ones.

If your dealer is unable to supply you use attached coupon.

S. C. JOHNSON & SON, Dept. MA, - RACINE, WIS.

When Writing to Advertisers, Please Mention Motor Age



Fine for Patching

Garden Hose
Rubber Boots,
Coats and Gloves
Rubbers
Auto Tops
Foot Balls
Hot Water Bottles
And All
Rubber Articles

S. C. JOHNSON & SON, Dept. MA, Racine, Wis.

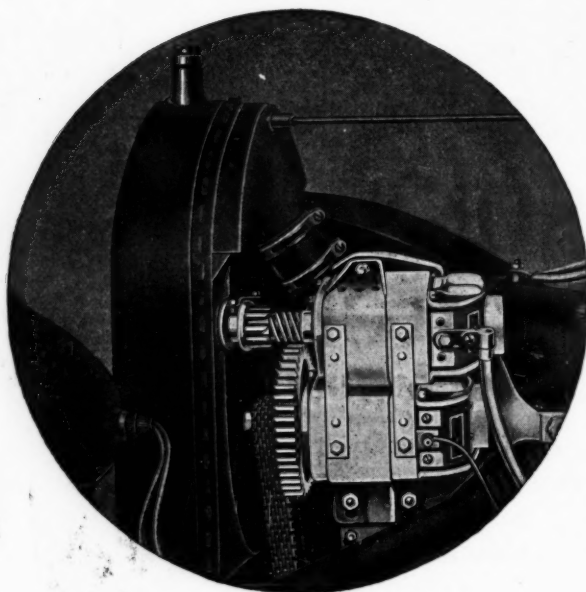
I enclose 50c for which please send me by prepaid Parcel Post a strip of Johnson's Hastee Patch from which 25 average size patches may be cut. Satisfaction guaranteed or my money back.

NAME

ADDRESS

CITY & STATE

GRAY & DAVIS STARTER for FORD cars



**Every Ford Owner
a Real Prospect**

Dealers who sell Gray & Davis Starters make money. Every Ford owner using this system always tells his neighbors of its wonderful advantages. This constantly develops new prospects, thereby increasing the demand for Gray & Davis Starters, which have proven successful on thousands of Fords everywhere.

*Write today for Booklet A-62
also our nearest distributor.*

GRAY & DAVIS, Inc., Boston, Mass.
Canada: Universal Car Agency, Windsor, Ont.

MOTOR AGE

Published Every Thursday by the
CLASS JOURNAL COMPANY
Mallors Building
CHICAGO ILLINOIS

Entered as Second-Class Matter September 19, 1899, at the Postoffice at Chicago, Illinois, Under Act of March 3, 1879—Member of the Audit Bureau of Circulations—Copyright, 1918, by the Class Journal Co.

United States, Mexico and U. S. Possessions One Year \$3.00
Canada One Year \$5.00
All other Countries in Postal Union One Year \$6.00
BEWARE OF SUBSCRIPTION SOLICITORS OFFERING PREMIUMS OR CUT RATES—ALL CURRENCY SHOULD BE SENT BY REGISTERED MAIL.

RENEWALS or CHANGES OF ADDRESS should be sent two weeks in advance of date they are to go into effect. Be sure to send old as well as new address to avoid unnecessary delay. RECEIPT of first copy is acknowledgment of subscription.

Subscriptions for The Horseless Age transferred to the subscription list of Motor Age in the merging of the two publications will be completed in full by the weekly issues of Motor Age to the dates of expiration shown on the records of The Horseless Age Co.

Vol. XXXIV Chicago, July 11, 1918 No. 2

Contents

MEETING THE LABOR SHORTAGE.....	5
Some effects of the shortage of motor car mechanics and what dealers are doing to help meet it.	
STRICT STEEL CONTROL RELAXES.....	8
EDITORIAL—TRACTOR INSTRUCTION BOOKS..	12
5315 U. S. TRAINING PLANES BY JUNE 8.....	14
FOOD DIRECTORS ENDORSE RURAL EXPRESS.	16
RULES FOR NATIONAL TRACTOR DEMONSTRATION	18
CHICAGO SHOULD HAVE RETURN LOADS BUREAU	20
FITTING THE TRACTOR TO THE JOB—II.....	24
RUNNING A CAR ONE YEAR.....	26
MAKING AIRPLANE PROPELLERS.....	28
ELECTRICAL EQUIPMENT OF THE MOTOR CAR	32
STUDEBAKER SERIES 19 SEDAN.....	42

DEPARTMENTS

READERS' CLEARING HOUSE.....	36
MOTOR CAR REPAIR SHOP.....	43
ACCESSORY CORNER	44
AMONG THE MAKERS AND DEALERS.....	46
FROM THE FOUR WINDS.....	48

"NORMA" PRECISION BALL BEARINGS

(PATENTED)



Never, so much as now, was the revealing light of critical analysis turned upon every minute detail of machine construction. From least to greatest, in every part, dependability must be apparent. Is it safe? —is it reliable? —is it efficient? —these are the questions which must be satisfactorily answered, today.

The ignition apparatus and lighting generators incorporated in the cars, trucks, tractors, power boats and airplanes that hold unquestioned leadership today, carry "NORMA" Precision Bearings as their standard bearings—because "NORMA" dependability is a known matter of record.

Be SURE. See that your Electrical Accessories are "NORMA" Equipped.



THE NORMA COMPANY OF AMERICA

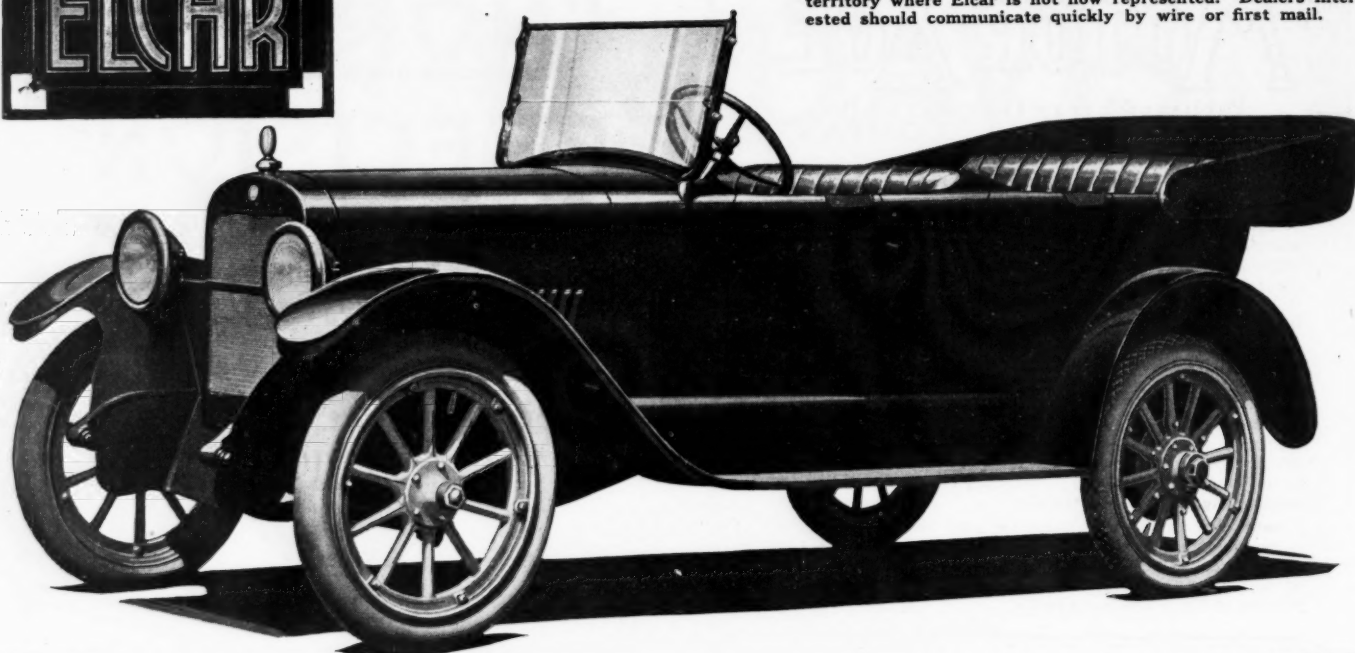
1790 BROADWAY

NEW YORK

Ball, Roller, Thrust and Combination Bearings



DEALERS—A money making opportunity awaits dealers in territory where Elcar is not now represented. Dealers interested should communicate quickly by wire or first mail.



"Most Practical Car I Know of to Own in These War Times"

—That's one owner's enthusiastic comment on the Elcar and here's his reasons:

It's big enough to give plenty of room—long enough wheel base to hold the road and give a pleasurable ride. Yet small enough to handle with ease. Turns almost in its own length. Throttles down on high speed to a crawl. Little shifting of gears is required. It's full of pep in the get-away, with ample power and speed for every emergency.

Light weight, scientific balance and good engineering result in *real upkeep economy*. Gasoline, for instance, yields eighteen to twenty-four miles, on an average, to the gallon—oil 1,000

miles to the gallon. Tire mileage runs exceedingly high. Repair expense is kept to a low level. The Elcar is built 150% strong in every part—built by an organization trained in building cars to sell at \$3,000 and over—it gives *years of dependable service*.

The Elcar is mighty good looking. As trim and graceful as a yacht—finished in the old many-process carriage builders' way—The kind of finish that *stays beautiful*.

The price of the Elcar is a long ways below its value, compared with other cars. See your dealer at once, for the demand is very heavy.

CATALOG ON REQUEST. Gives full information regarding the 1918 Elcar model. Gladly mailed to anyone interested with name of nearest dealer.

ELKHART CARRIAGE & MOTOR CAR CO. C-781 BEARDSLEY AVE.
ELKHART, INDIANA

Elcar Four-Cylinder Touring Car and Roadster \$1175

Elcar Six—Touring Car and Roadster \$1375

Elcar Specifications In Brief

Four-cylinder models have powerful long stroke Elcar-Lycoming motor, developing 37½ horsepower at 2,100 r.p.m. Six-cylinder models have famous Continental 3¼x4½ inch engine, developing 40 horsepower at 2,100 r.p.m. Outside of the power plants, the Elcar sixes and fours are practically the same. Two unit electrical system. Long wheel base, 116 inches; road clearance, 10½ inches. Full floating rear axle with spiral bevel driving gears. Timken Roller Bearings front and rear. Double universal drive; tubular propeller shaft. Copper cellular radiators. A wonderful easy riding semi-elliptic spring suspension. Roomy and comfortable bodies of beautiful design and durable finish; new "Cathedral Pipe" upholstery. Equipment complete, even to motorometer on radiator.



New Elcar Sportster model, \$1,175 with four cylinder power plant and \$1,375 with six cylinder power plant.

MOTOR AGE

Meeting the Help Shortage

A serious shortage of expert mechanical help is facing the dealer, especially in the smaller towns. The draft has taken men; many have volunteered; others have been attracted by big wages in munition plants. The motor car dealer operates short-handed, while investigation shows just as many cars and trucks coming in as ever. It means the dealer must refuse certain work or, as in some actual cases, close shop for a time. The dealer fortunate enough to have kept his best mechanics is going tooth and nail, while the less fortunate are merely dabbling in a few accessories, having perhaps a better equipped shop than the first. It would seem possible to bring such dealers together, operating under one overhead. Both would gain.

Organize a Liberty Garage in Your Town

HERE IS THE WAY TO DO IT

- 1 Get a list of all the garagemen and dealers in your town. Put aside all thoughts of competition and focus on winning the war and keeping your business alive at the same time. If you have an association, it should make the work easier. Have a special meeting and get all the members out. If you have no association, invite the other dealers to your place and tell them of your plan.
- 2 Let each man air his troubles. In this way you will find the exact conditions of affairs. Take copious notes, being careful to get the exact number of skilled mechanics not liable to draft call.
- 3 If you have an association let the president appoint a committee for the Liberty Garage, otherwise appoint a temporary chairman and elect officers. In any case form a committee, not over three members. A small committee works better.
- 4 Let the committee draw up suggestions, which should be along the following lines:
 - A Find out who the two or three best equipped dealers are;
 - B How many skilled mechanics there are;
 - C What is the average number of cars handled in that city each day.
 - D Instruct owners to make their own minor repairs.
 - E Arrange a scale of wages so all profit alike. Keep the best men on the particular jobs, letting the second-rate men do tire and general ground floor work.

The suggestions on the preceding page are the result of ideas obtained from dealers themselves in an investigation of the service shortage situation just made by MOTOR AGE. They are subject to change by each town, or group of dealer and service stations, as may be most suited to that particular community. Briefly, the whole idea back of the plan is to bring the man with a good equipment but no help and the one with skilled men together. It means a more complete layout and a larger capacity, so that more cars can be handled. What one shop has the other may not have, so both gain by temporarily doubling.

The dealers should decide the best building to use for a general place of business, calling it the Liberty Garage, Wartime Municipal Garage, or similar name. One or two places could be operated as subsidiaries, under the same management and assuring car owners of the same service. One of the questions to solve is that of the leases. Certain establishments that might lend their machinery and men would have to close their doors and to cut overhead would have to get around the lease. Arrangements might be made with proper authorities to hold up on the leases for the time being. That is a detail.

Some Effects of the Labor Shortage

What Various Dealers Are Doing

THE greatest problem confronting dealers and repairmen in the smaller towns is the lack of skilled mechanics. A recent survey by a MOTOR AGE representative revealed some startling facts in Northern Illinois. Some dealers have given up the repair end altogether, while others are contemplating similar changes.

There are several reasons for this. The most direct cause is the draft. This has taken hundreds of skilled men; many almost impossible to replace. In some cases it means the garage owner must turn down work and take on only work of such caliber as he knows his surviving quota of help can handle.

Many dealers have this complaint to make: that the skilled men out of the draft age, knowing the shortage of help, take on an indifferent attitude and do about as they please as the owner dare not resort to drastic measures for fear of losing his men.

Going Into War Work

Another is that mechanics seeing the possibilities in Government work leave their jobs, earning sometimes twice what they did before. One Illinois dealer stated that he got around this by giving his best men very high wages and charging the motor car owner more in proportion, explaining that his service is the best obtainable and that by keeping his men, inferior repair work is guarded against. To the question asked what he would do if his shop men were to leave, one dealer said he would lock his doors. He pointed out the impossibility of training green help and still keeping the owners satisfied.

Still another complaint of the small town dealer is the inability to get parts. He tells of holding cars in the shop often for weeks at a time owing to the factory sending the wrong parts or through the congested conditions of the express and freight lines. Concerning the express and freight conditions it is hard to offer a solution, but the car manufacturer or large service can help the first case considerably. To illustrate; a certain small dealer had on hand a car needing a new interrupter for the magneto. He sent to Chicago for

it, giving the number, in this case, 176-W. The order was sent marked rush, as the car owner needed his car for daily use in the grocery business. In a few days the part came, but instead of an interrupter assembly, it was some other part, with a catalog number 196-W. It meant a delay of several days and much annoyance to both dealer and owner. When traced down it

revealed the stockroom in Chicago in charge of a boy who had not read the order number carefully. Dealers complain quite generally of this situation. It means the parts supplier must keep a well ordered stock room. An old employee can pick out the part off hand, but the new man or boy must run his finger down the catalog looking for the number, and this is where the mistake often comes, in that the wrong number is applied.

One way of partly getting around the help shortage is that used by a dealer in Aurora, Ill. When an owner drives in and complains of a slight trouble like squeaks, etc., in the body or chassis, he simply passes up the job, suggesting one or two ways of overcoming the trouble or possible places to look for the squeaks. In this way he saves the mechanic's time and keeps the service room relatively free from unimportant repair jobs. The car owner gets more familiar with his car also. **THIS WOULD SEEM LIKE A FOREWARNING TO OWNERS GENERALLY THAT THEY MUST IN THE FUTURE DO MOST OF THEIR REPAIRING, LEAVING ONLY SUCH JOBS AS BEARING FITTING AND AXLE REPAIRS TO THE SERVICE STATION.**

Here's what a Ford dealer just outside of Chicago does. His service and maintenance department is running stronger than ever and to handle it he is training men two years this side of the draft age in Ford maintenance. The men work under a trained mechanic and none is taken who has had previous motor car work, the idea being that such men learn the ins and outs of repairs more quickly. All are given the same training: that is, no one man is given ignition work and another only bearings, etc. This means the shop will not be handicapped should one or more of them leave, as any one man can finish a job that some other has begun.

So far as women are concerned to assist in the labor shortage the opinion of dealers seems divided. Cases have been reported of successfully using women for washing cars, general floor work and vulcanizing. In one instance a girl in charge of the office also makes repairs on tubes, conserving the time of the floor man. **CAR WASHING IS CONSIDERED DIFFICULT WORK BY MANY DEALERS, BUT IT SEEMS LIKELY THAT WOMEN ULTIMATELY WILL HAVE TO DO IT.**

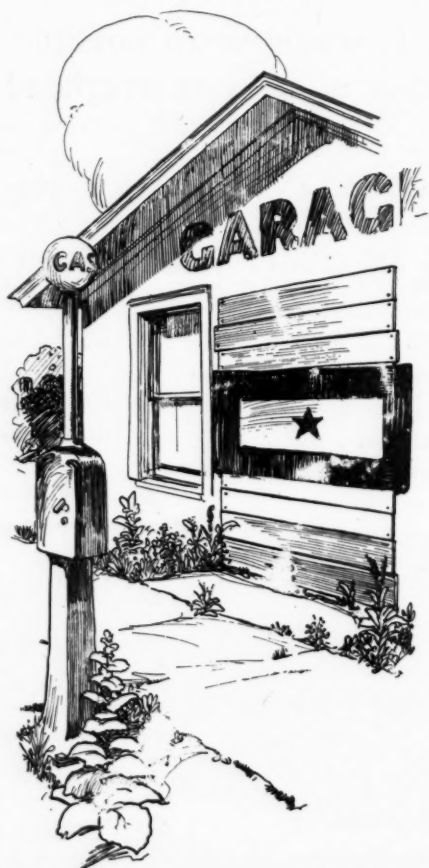
Chances for Ingenuity

There is now more than ever a chance for applied ingenuity in the repair shop; the usefulness of the lathe, shaper, drill press and grinders is augmented by shop-made special tools and riggings made when needed and kept for future work. This is particularly true of the shop with a modest equipment.

Shop ingenuity often takes the place of elaborate tool equipment. A first class mechanic will not give up a job because he has no milling machine. Instead he figures out a scheme by which a simple home-made rig applied to the lathe will do the same thing. Here is what one mechanic did when confronted with a job of rebor-ing that could not be handled in a lathe:

He made a boring bar to fit the drill press. The upper end of the bar was tapered to fit the drill chuck and the rest of

There Will Be More



This particular garage was seen at a Connecticut cross roads, but it is not the only one, and there will be more of them

These Are Appearing Every Day in the Want Columns

NEBRASKA STATE JO

HELP WANTED—MALE

37
Pharmacy. 13th and P. Sts.
MILKER—Wanted, to hire an experienced, Young's Dairy Farm. 156 So. 33d. 23rd St. B1408.

MAN—Wanted to assist special sales manager and learn the business; must know general merchandise. See St. Cannon. 296 Security Mutual Life Bldg. today.

MEN—Wanted for work. County surveyor's office. 14th and P. Sts.

MAN—Ford repair man wanted. Evans Laundry.

MAN—Wanted for shop work, must have experience; apply at Pinney's Garage.

apply at desk.

HELPERS

JEWELERS. 17 TO 46. Travel. 37
Age unnecessary. reports. 37
Investigations. American Fore. x
Secret expenses. 263 St. Louis. x
Detective Agency. 263 St. Louis. x

WANTED—METAL POLISHERS.

Apply

WANTED—BRUNSWICK-BALKE-COLLENDER CO.

Steady work.

WANTED—GOOD CAR WASHER.

Belsky-Cook. -1-8

WANTED—TWO BRUNSWICK-BALKE-COLLENDER CO.

7-6

FEMALE HELP.

YOUNG, AMBITIOUS WOMAN. 37
Notice: Young, ambitious woman, capable in feeding newspaper, press and apt in setting ads. 56-hour week directed. Modern equipment. 56-hour week, 1 1/2 rate for overtime; pay every Saturday.

WANTED—Body builder, one that can build all kinds of commercial bodies, rebuild hearse bodies; \$30 per week; steady job. Bardwell Auto & Carriage Works, Great Bend, Kan.

WANTED—Middle-aged man, without family, to live on place, for gardening, chores and general work. All year job. Must have references. Apply to Mr. J. J. O'Connell, 10th and P. Sts.

WANTED—Blacksmith, all-round man; must be first-class mechanic; \$30 per week; steady job. Bardwell Auto & Carriage Works, Great Bend, Kan.

WANTED—Thirty carpenters. New manufacturing building. Havelock, Neb. One block west Burlington depot. W. J. Assenmacher Co., Contractors.

WANTED—At once, a first class Hoffman pressman; will start at \$20. Steady employment. Vallet Cleaners, Sioux Falls, S. D.

WANTED—Tailor, man or lady. Man preferred that can operate the Hoffman steam pressing machine. Phone 230. John A. Pollock, Columbus, Neb.

WANTED—Experienced automobile repair man. Apply service department, Guy L. Smith, Twenty-sixth and Farnam streets.

WANTED—Permanent position. St. Joseph Drug Co., St. Joseph, Mo.

ACTIVE young man with two years' drug experience. 122 1/2 1st St. Phone 1622.

WANTED—A good auto repair man for garage work. A. B. Rasmussen, Walnut, Neb.

LEARN barber trade, low rates now. Call or write Barber College. 1124 Douglas St.

A MAN to work in our valet shop, good pay. See auditor Hotel Fontenelle.

Times

One Cent a word For

No Advertisement taken for less than in advance. No book accounts.

Help Wanted—Male

In Answering Advertisements Be Sure to Mention "The Times"

Wanted

2 Good Mechanics AT ONCE

Pay no object

Harvey Garage

1025 16th Ave.
East Moline, Ill.

AUTOMATIC SCREW MACHINISTS (B. & S.) OPERATORS

CABINET MAKERS

MILLWRIGHT HELPERS

WASHER AND BUFFER

DIETZEN CO.

FULLERTON AND SHEFFIELD

AUTO MECHANIC—ON COMMERCIAL CARS A. T. WILLET CO., 703 Sebor-st

AUTO MECHANIC—EXPERIENCED ON Marmon car, highest wages; willing to leave city. Address C 286, Tribune.

AUTO TESTER—MAN WHO CAN REPAIR and adjust carburetors; good job for a good man. 57 E. 21st-st.

AUTO MECHANICS AND MOTOR REPAIR

AUTOMOBILE MECHANICS. HENRY MOORE Livery Co., 57 E. 34th-st.

WANTED

Two first class mechanics (Above draft age.) Steady employment.

Buck Motor Co.

221 East Second St.

Importantly for first

ULMAN; best of wages; steady work; nonunion. In applying state age and places worked for past five years. Address K O 473, Tribune.

FORD MECHANICS.

Good, permanent positions; good working conditions. MR. PIPER, 3616 Wabash.

FOREMAN.

Man who knows all about making mittens and shoes; good chance for advancement; must have good ref. Apply Room 606, 19 S. La Salle-st. Ask for Miss Goldner.

GATHERING AND BINDING OPERATOR

the bar ground true. A hole was cut in the bar for an adjustable cutter, held securely by a set screw. So far there is nothing extraordinary about this rig, but here's where the alertness to opportunity shows itself. The lower end of the bar naturally had to be supported, on account of its length. This was done by utilizing the hole always found in the center of the drill press table. A bronze bushing was made to fit this hole and the end of the boring bar ground to fit the hole in the bushing. Thus the bar was supported rigidly and the ordinary drill feed used to run it up and down. The adjustable feature and means of supporting made it possible to use this device

on many other jobs, even though it required a little extra time to make.

The above instance shows the value of a good mechanic. One Northern Illinois garageman stated that he doubled the wages of his best shop man to keep him from joining the multitude seeking Government work. He explains it by stating that this man alone is as good as three average mechanics, because often he contrives temporary repairs to keep a car or truck going, while parts are coming from the factory. And the owner able to get his car over the ground is less likely to find fault with repair bills than the one who has his machine tied up for days at a time while the

inexperienced man is solving what to him seems a mystery.

This instance also shows that the dealer should go slow in buying new machinery at the suggestion of second-class mechanics. The tendency is always strong for such men to want special machinery when a problem a little out of the ordinary confronts them. Go slow in the selection of tools, that you may not be loaded down with things used so seldom that the profit on use will not pay a reasonable return for investment. Also consult your mechanic when buying second-hand machinery. Only an expert workman is competent to judge the slightly

(Concluded on page 9)

Strict Steel Control Relaxes

Farm Tractor Jobbers Can Maintain Stock and Approved Deliveries Be Made Without Priority Certificates—Other Provisions

WASHINGTON, July 6—New rulings by the War Industries Board relax the strict steel control, and steel shipments to consumers will not require priority certificates in all instances. Jobbers of farm tractors and similar products will be allowed to maintain their stock and replenish them but must observe the essential minimum when placing orders. They must sign a pledge to prevent hoarding and to sell their stock only for essential uses. They must exact similar pledges from their customers. By meeting these conditions they will be assured prompt shipments by the makers and priority ratings from the War Industries Board.

Deliveries That Are Approved

In addition deliveries approved by the board can be made to consumers not only after priority certificates are filed but any time such deliveries do not interfere with the filling of priority certificates. Approved orders are unnecessary for steel or pig iron shipments not exceeding 5 tons, provided such shipments are reported monthly to the board with a producer's certificate that the order was filled in the public interest.

The classifications for steel consumers are:

Classes AA, A and B—Ships, including destroyers and submarine chasers; aircraft, munitions; fuel for military, naval and domestic consumption including war manufacturing plants.

Class C—Fuel for food, clothing and like

industries; public utilities serving war and civilian needs; tools, implements, utensils and equipment required for production, harvesting, milling and preparing and refining foods, binder twine, etc.

All necessary raw materials and partly manufactured parts and supplies for completion of food products; food stuffs for human consumption; feeding stuffs for domestic fowls and animals; collateral industries including such as fertilizer; containers for foods, feeds, etc.; materials for preservation of foods.

Clothing for civilian population.

Railroads and other necessary transportation equipment.

Public utilities serving war industries, army, navy and civil population.

Class D—All industries and products not included in the preceding.

These classifications are as vague and indefinite as the original preferential list issued by the War Industries Board on June 6, 1918, which included these products and industries and demanded priority certificates for all. The classifications make no attempt to define specifically the industries coming under each. Priority certificates will be issued only for classes AA, A and B. The class C orders will be filled at any time their delivery does not interfere with the filling of the priority certificates.

Though officials of the War Industries Board decline to make definite classification of the products of the automotive industries and no official ruling has been given, interviews with the board officials testify to the following as the approxi-

mate classifications which will prevail:

Classes AA, A and B—Airships, passenger cars, trucks and motorcycles for war purposes, direct or indirect. Military tractors.

Class C—Farm tractors, commercial trucks, passenger cars partly finished and requiring only certain parts for completion, passenger car factories performing considerable war work where it is desirable to maintain that part of the organization working upon passenger cars, motorcycles.

Class D—Passenger cars not strictly for utilitarian purposes or not specified in the preceding classifications.

All industries and products in class C, according to the War Industries Board announcement, are practically assured of ample steel and pig iron supply. The War Industries Board will give approval to all orders for class C steel consumers. Class D consumers will receive equal division of the steel supply remaining after the other classes are supplied.

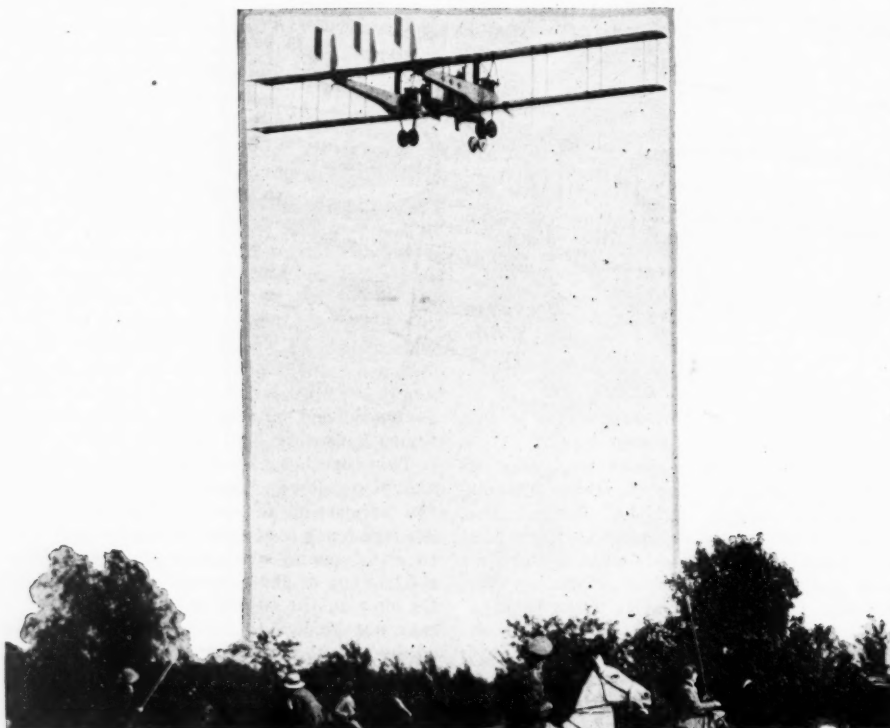
The best plan for all manufacturers to pursue, if not in classes AA, A or B, is to assume that they are in class C and apply for a full supply of steel and pig iron from the producer on that basis. Their application will be forwarded to the War Industries Board, where each will receive consideration and definite ruling will be made.

According to some officials of the War Industries Board a plan is now under consideration whereby steel will be supplied to all manufacturers of passenger cars under a license plan whereby they will be allowed to make and sell passenger cars which will not be for pleasure purposes. The plan is at this time very vague in the minds of those conceiving it. They are considering some method by which the purchaser will supply a certificate testifying to the uses planned for the car he buys. If some such plan can be operated successfully, it is quite likely the manufacture of the great bulk of passenger cars which goes to the farmers, doctors, contractors and other businesses and professions will be continued.

Class D Orders

Applications for class D orders amounting to more than 5 tons in the aggregate must be filled out and mailed in duplicate to the director of steel supply on blanks provided by the War Industries Board. The applications must be made by the manufacturers of steel only and not by the purchaser.

If reasonably satisfactory delivery can be secured out of class C orders, no application for a higher priority rating need or should be made to the priorities committee. Purchasers of steel under class C rating need only to apply to the steel producers for their supplies. In event a consumer is unable to find a producer or manufacturer who will accept his order, application for allotment should be made to the director of steel supply only when supported by strong evidence in writing that



Here is shown one of the Caproni airplanes fitted with three Liberty engines

the public interest requires that such order be placed and filled.

The War Industries Board considers it in the public interest that jobbers dealing in plates, sheets, bars and shapes, structural shapes, tubular products, wire and wire products, tin plate, heavy hardware, farm implements, mining tools, machinery and equipment, oil well supplies and similar products should be permitted to maintain reasonable stocks from which Government agencies, war industries and the civilian population can meet essential requirements. The jobbers, however, will be limited by voluntary co-operation to an absolute minimum of both jobbing and retail stocks. They will operate under the following plan:

Each jobber will file before the 5th of each month with the director of steel supply, War Industries Board, a certified statement covering shipments made during the preceding month. Forms will be furnished for the statements by the War Industries Board.

Manufacturers will be expected to scrutinize all orders from jobbers to guard against hoarding.

All orders placed in accord with these rules will be rated as class B-4 and will be entitled to class B priority and precedence, provided the jobber placing the order has filed with the priorities committee and the director of steel supply, War Industries Board, a pledge in writing as follows:

The Pledge

"I do hereby pledge myself not to use or so far as lies within my power, permit the use of any stocks now in or which may hereafter come into my possession or control, save (1) for essential uses as that term may be defined from time to time by the priorities division of the War Industries Board, or (2) under permits in writing signed by the director of steel supply; that I will make no sale or delivery from such stocks to any customer or retailer before his filing with me a similar pledge in writing; and that I will use my utmost endeavor to prevent the hoarding of stocks and to insure that they be distributed solely for essential uses."

When this pledge has been once filed the jobber should certify this fact on each order when placed with the manufacturer. Manufacturers will not accept orders without such certification.

No applications for licenses to export iron or iron and steel products should be made of the War Trade Board, except on direct orders of the U. S. government and its Allies, unless the orders are (1) covered by priorities certificates class AA, A or B or (2) covered by a permit signed by the director of steel supply.

AUSTIN TRACTOR THIS FALL

Chicago, July 6—The F. C. Austin Corp., has for some time been developing a farm tractor which it expects to start production on this fall, and to build in quantities. This company has for years been a large manufacturer of road machinery, the manufacture of which is continuing but a new factory is being built for tractor production. Technical details are not available but it is expected the tractor will sell somewhere between \$1,600 and \$2,000.

400 Added to N.A.D.A.

Some Cities Report 100 Per Cent While Others Send in Name Lists Ahead

War Economies Board Approves Conservation Measures

ST. LOUIS, July 8—More than 400 membership applications were received at the N. A. D. A. office last week. Brooklyn, N. Y., sent a 100 per cent list of the local association membership, twenty-three dealers, with checks. Other cities where the applications centered were Pittsburgh, Pa., LaCrosse, Wis., Hutchinson, Kan., New York, Harrisburg, Pa., and Philadelphia, Pa. Several of these cities reported that their lists would be 100 per cent within a very short time but that they did not hold back the names to send all the list at once.

John C. Shuford, president of the St. Louis Motor Trade Accessory Association, wired from Cape Girardeau, where he went to address a meeting of dealers, "that all Southeastern Missouri dealers had heartily approved of the war service regulations and extended compliments to the N. A. D. A. for effective work."

In some sections of the country there still are dealers who doubt that the program for conservation outlined by the War Service Board has the approval of the Government. One of the N. A. D. A. workers met such a dealer and to convince his man wired to the War Economies Board. The reply was signed by Melvin T. Copeland, secretary of the Conservation Division of the War Economies Board and ought to settle any doubts. It read:

"Program for economy in the retail automobile business was drawn by the War Service Board at our suggestion. Details of program were determined by the committee and approved by the commission. We are in sympathy with its purpose, obviously of importance—labor, material and equipment must be saved in every practical way to aid in carrying out the war program."

Local associations in the following cities have reported 100 per cent for the war service program:

Richmond, Va., Cincinnati, Ohio, Youngstown, Ohio, Dubuque, Iowa, Topeka, Kan., Nashville, Tenn.

W. H. Imes, president of the Automobile Dealers' Association of Kansas, wrote that "every small town we have been able to reach has accepted the program."

The following cities reported local associations 100 per cent for N. A. D. A. membership: Waterloo, Iowa, Dubuque, Iowa, Cincinnati, Ohio, and St. Joseph, Mo.

WOULD HAVE MORE BOY DRIVERS

Boston, Mass., July 18—Because of the scarcity of young men to drive motor vehicles the dealers of Boston are to have a meeting next week at which the matter of changing the age limit for driving for hire will be taken up, and a committee appointed to see the highway commission on

the matter. Under the present law a boy sixteen years old can drive a machine under an operator's license, provided he is not paid for the work. To drive for hire a person must be eighteen years old. The dealers think a boy sixteen years old who is capable of driving without pay ought to be able to drive for compensation.

There is one obstacle, as the present law is a legislative enactment, but some of the dealers think that under the powers granted to the highway commission they may be able to make a regulation which, if approved by the Governor and the council would cover the case. That is why they are taking the matter up. The headlight regulation is not a legislative enactment but a highway commission rule, and the dealers believe if lights can be so regulated that the age limit might be changed due to stress of war. Some of the dealers feel that there are a lot of young men more than 17 years old who would make good drivers if given the opportunity, and this would release older men for the heavier trucks if the commission felt that the younger lads should be restricted to light machines. By a thorough examination it would be possible to select the capable drivers and, if necessary, limit the power of operating to specific vehicles.

M. A. M. A. OFFICE DISCONTINUED

Washington, July 6—The office of the Motor and Accessory Manufacturers' Association in this city has been discontinued, as forecast in last week's issue. A. W. Copland, who was the special representative for the association here and who will continue as chairman of its war service committee, has returned to his business duties in Detroit. Mr. Copland is the head of the Detroit Gear Co.

The Washington office was established as the point of contact between the industry and Government departments, aiding the members of the association to secure war contracts. This work is no longer necessary, because of the establishment of purchasing departments throughout the country by the Government.

EFFECTS OF LABOR SHORTAGE

(Concluded from page 7)

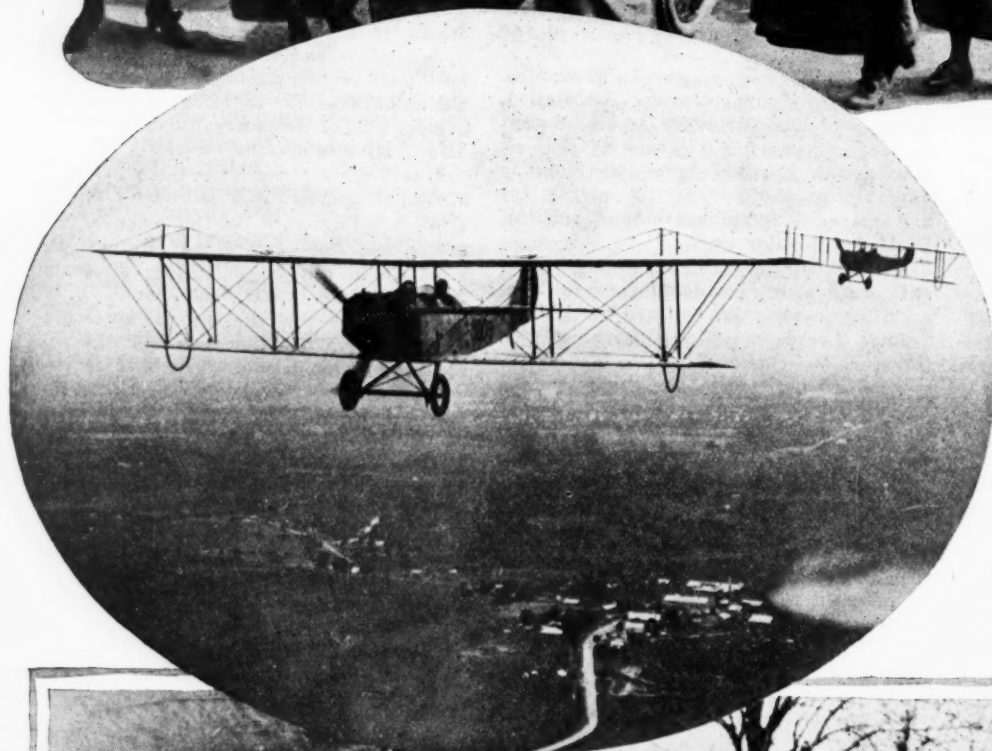
used and much abused shaper, drill or whatever the apparatus consists of.

Some of the small dealers can help matters considerably by adding a few labor-saving devices in the shop and use to the best advantage the help at hand. A case recently came to notice where four mechanics had been employed in a shop. Two were drafted, leaving the others to do work which kept coming in at the same rate. Before this when an engine, for instance, was removed, three of the men took it out. Now one man does the same thing by using a chain hoist suspended from a shop-made pipe frame. It has the additional advantage that the engine can be worked on when elevated by the hoist, speeding up the job. In another shop many different sizes and shapes of pinch bars have been installed. These are for removing gears, housings, etc., from cars of different makes, as it would be folly for the dealer to stock up with a large number of wheel and gear pullers each fitting but one make of car.

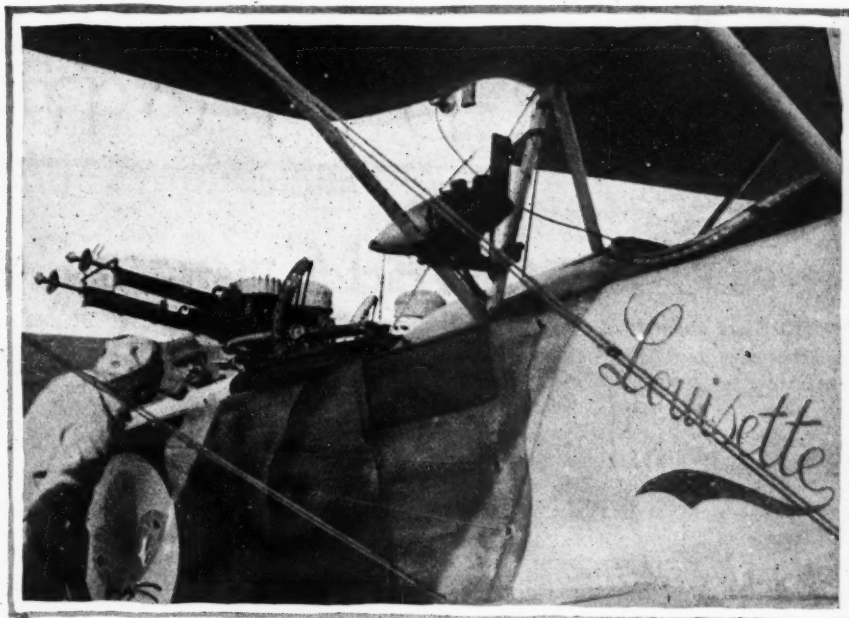


War Motors in Action

Woman airplane constructors pulling their machine in a recent rally and demonstration held in London are shown at the top, while in the oval United States planes appear flying in formation at Kelly Field, San Antonio, Tex. A long line of American transports and trucks on the way to advanced positions in France, below



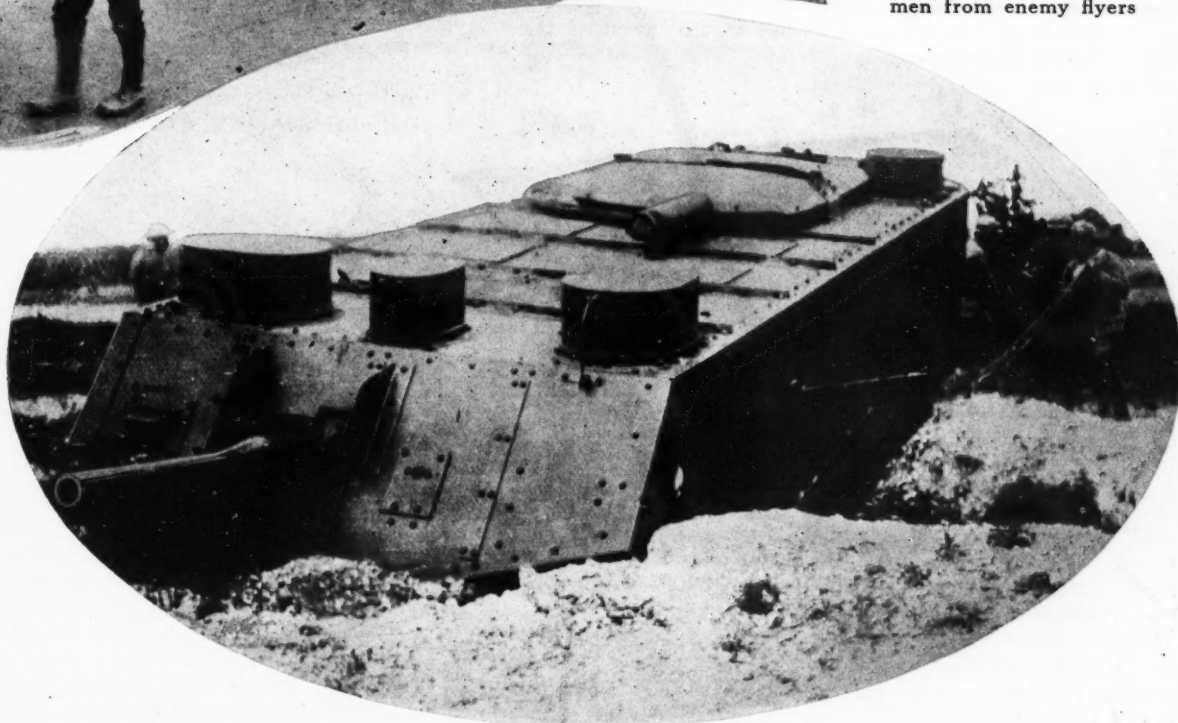
FRENCH, BRITISH AND
MEN OF THE A. E. F.
SNAPPED IN FRANCE
WITH
PLANE,
TRUCK,
TANK

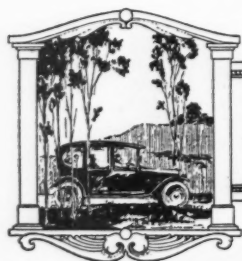


Here is the most modern device used by the French air fighters. Twin machine guns placed on the airplane so that one man can operate both at one time whereas it might require two otherwise

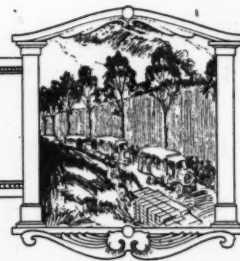
Left, British Tommies returning from the firing lines do so under the anti-aircraft guns' wings. The guns have been rushed forward on trucks to protect the men from enemy flyers

The United States marines use this huge French tank over in France





EDITORIAL



Tractor Instruction Books

THERE are about two good farm tractor instruction books on the market to-day, books which can be relied upon to give the farmer a pretty clear idea of the parts of his tractor and how they can be repaired and what attention they should receive. These books constitute a goal at which all other tractor manufacturers should aim and they are an opening chapter in the volume that will tell how tractor service is to be solved not only in America but in the world.

✻ ✻

THE tractor instruction book should not be a catechism. The very nature of a catechism primarily is opposed to that of giving a well rounded-out idea of any machine. Publishers of technical books discovered years ago that the catechism type was a poor seller and proved a financial failure to authors and publishers. The catechism lacks a continuation of interest. If it is arranged alphabetically then the subjects do not follow one another in sequence of interest. The natural relationship of one subject to another is broken up by the arbitrary alphabetical sequence.

✻ ✻

THE better way to draft a tractor instruction book is that of following the psychological plan.

✻ ✻

THE psychological law of going from generals to particulars must be followed. That is, the first text in the tractor book is to give the tractor owner a brief yet clear conception of the entire layout of the machine rather than plunging into the details of the machine or explanation of the electrical system or some detail of the carbureter. This psychological law also can be expressed by proceeding from the whole to the parts, that is, giving a general scheme of the layout of the whole tractor before going into detailed descriptions of the different parts.

✻ ✻

THIS law of psychology, which can be explained in two ways—either going from generals to particulars, or from the whole to the parts—must be applied to the illustrations as well as to the text or reading matter. According to this law the first illustrations must given a general outline of the tractor. Perhaps a photograph of it followed by some plan photographs showing the arrangements of all the machinery parts, which in turn might be followed by a reproduction of a blueprint plan, thus carrying the mind a few steps further in this conception of the machine as a whole. Along with these illustrations must go suitable text.

✻ ✻

ONCE a complete conception of the whole tractor or general idea of the machine has been given, which might occupy chapter one of the book, the next psychological step is that of analyzing the whole tractor into its various systems, such as the chassis construction system, the power transmission system, the electrical system, the carbureting system, the cooling system, the control system and, perhaps, the suspension system. This is in accordance with another law of psychology which says that analysis must precede synthesis, that is, that we separate a complete tractor into its various systems and thus gain a knowledge of it, rather than first describing the different systems separately and building them up or synthesizing them into a complete machine.

A HOMELY application of this is that a child, presented with a new toy, learns of that toy by taking it apart. No father or mother would think of presenting to a child the different parts of a toy and expecting the child to put those parts together and build up a toy. Such would be impossible for the child. It would be diagrammatically opposed to the psychological laws to which the minds of all human beings operate. The child must first take the toy apart. Then, without instructions or commands, he starts to putting the parts together again. His mind wants to work in obedience to the psychological law of analysis preceding synthesis.

✻ ✻

THE child is father of the man, and as with the child and the toy, so with the farmer and the tractor. He must analyze it before he can synthesize it, and if the instruction book is to be a valuable book it must be based on this law of analysis going before synthesis. Consequently, those chapters immediately following the opening one in which you have given a complete conception of the machine must deal with the analysis of the tractor as a whole, as outlined, followed by the analysis of the different systems referred to.

✻ ✻

IT does not make much difference the order in which the different systems are taken up, but it is essential that each system be handled psychologically, that is, that it be described as a whole system and then broken up or analyzed into its various parts as necessary. The illustrations must show the complete system first, followed by as many detail illustrations as necessary, showing the parts composing the system and the relationships among them. This system of illustrations must be followed throughout all chapters dealing with the different systems.

✻ ✻

IT is impossible for any farmer to understand completely any detailed mechanism in a tractor without first knowing where it fits into the tractor and the relationship that it bears to the tractor as a whole.

✻ ✻

THE great value of any psychological arrangement in any book is that the very chapters and paragraphs of the book are made interesting because they are psychological. You cannot possibly make the mind work along lines other than those laid down by the laws of psychology any more than you can expect a stone to jump upward from the earth in opposition to the law of gravity, or that you can expect a sail boat to head into a stiff gale with the sails set the same way that you would set them to go with the gale.

✻ ✻

THE mind always works from generals to particulars and never from particulars to generals. If you write an instruction book that handles a subject along the lines of from particulars to general nobody can get interested in that book or get the value out of that book that you expect. On the other hand, if you write the book handling the subject psychologically, from general to particulars, and putting analysis before the synthesis, the book will be interesting in spite of the words used, because interest in a book rests with the psychological presentation of the subject rather than with the words used and the grouping of them.

Effect of Frost on Roads

Shows Need of Good Draining and Emphasizes Urgency of Proper Maintenance

ON this page are reproduced two very interesting photographs that show the extremely severe effect of frost action in Northern Ohio on some of the most recently paved highways. MOTOR AGE can do no better to bring home to the different states and communities the need of keeping the roads clear of snow and of draining them properly because this is what comes as a result of deterioration of roads with the spring thaw. It is an engineering fact that roads covered with snow during the winter months deteriorate more quickly with the coming of warm weather than do roads from which the snow has been cleared systematically. The effects illustrated here were noted throughout a wide area, though in comparatively short stretches of road in each instance.

The lesson the photographs have to bear on drainage is that offered by the severe frost of the last winter and spring. In many places, notably on the Cleveland-Akron road, both brick and bituminous pavements have been heaved and broken into the semblance of mountain ranges on a small scale. The worst destruction followed a freeze after a thunder storm early in March. The winter frost had left the ground only partly before the storm. Inadequate drainage as a result permitted the storm water to flood the road until the



Destroyed Bituminous Pavement

frost came. Sections that had been given special attention as to drainage escaped

the bad deterioration that others knew.

It is not too early to consider steps toward keeping the roads clear of snow this winter and prevent a great deal of this deterioration in your neighborhood.

Cleveland-Akron Road



5315 U.S. Training Planes by June 8

Combat Type Totaled 286 for Same Period—More than 2000 Liberty Engines

WASHINGTON, July 5—Up to June 8, 4495 elementary training airplanes were delivered to the United States government by manufacturers in this country. Up to Jan. 8, 820 advanced training airplanes were delivered. This information, together with other data, was submitted to Congressman S. H. Dent, Jr., by Secretary of War Baker this week. The further information regarding aviation included: The average weekly production of advanced training planes during April was twenty-two; during May, forty-five and one-half; week ending June 8, seventy-eight.

To June 8 286 combat planes were delivered. The weekly average of this type of machine in April was five; in May, thirty-eight; week ending June 8, eighty.

More than 2000 Liberty engines have been delivered to the Army and Navy. The average weekly production in April was ninety-six; in May 143, and in the first week of June 115.

In all 37,250 machine guns were delivered for use on airplanes before June 8.

Discussing artillery motorization Secretary Baker stated:

"Ordnance engineers, it seems, are well on the way to a solution of the problem of the motorization of field artillery. The problem of motorization of light artillery has been a constant factor in slowing up the advance of troops to await the bringing forward of their supporting guns. Tractors have been used by all nations, of course, to haul heavy pieces along good roads, but they have been unable to develop tractors for hauling light pieces over shell-shattered ground. On June 3 the Ordnance Department demonstrated a 5-ton armored artillery tractor which proved capable of negotiating the most difficult terrain, hauling a 4.7 howitzer, which weighed approximately 9000 lb."

WOMEN WORK ON AIRPLANES

Washington, July 5—Women are packing parts, stuffing bags with excelsior, working on wire parts, cutting copper pieces, binding wires with tape and soldering joints of wire, applying "dope" and painting the United States emblem on the bodies of the airplanes in airplane factories, according to a report made by the Women's Committee, Council of National Defense. They are also doing light carpentering and metal work and sew linen on the wings.

DES MOINES BOOSTS TRUCKING

Des Moines, Iowa, July 6—Iowa is getting ready for the rural motor express. About a month ago the first definite step for motor truck rural delivery was taken at Council Bluffs, where a company was incorporated to carry on a trucking business in the rural districts. The sentiment in Des Moines has been crystallized by two trial runs to nearby county seats. Dean Schooler, president of the Des Moines Au-

tomobile Association, and Harter B. Hall, president of the Des Moines Motor Truck Association, are taking the lead in the movement here.

The International Harvester Co. has sent A. B. Hancock to Des Moines to co-operate with the Des Moines man. The trial runs were held under Mr. Hancock's direction. A fleet of five trucks carrying 16,500 lb. of freight made the run to Indianola, 18 miles, in 1 hr. 45 min. The return trip, empty, was made in 1½ hr. The expense of the trip amounted to 10½ cents for each 100 lb. of freight. The actual saving in expenses over freight and drayage at both ends was figured at \$23.41.

WRIGHT-MARTIN MAKES 25 DAILY

New York, July 5—The Wright-Martin Airplane Corp. is reported to be producing engines at the rate of twenty-five a day, this being an increase of five a day over the production a month ago. It is expected that a new plant in Long Island City will be ready for operation soon and that production will be brought up to fifty engines a day before the end of the year.

EIGHTY TRUCKS IN SERVICE

Washington, July 5—Relief of freight congestion between Washington and New York will be undertaken by the Beam-Fletcher Transportation Co. of Philadelphia and the Maryland Motor Fast Freight Co. of Washington, which will operate



Maj. John Purroy Mitchel, former mayor of New York and an officer in the aviation section of the Signal Corps, was killed at Gerstner field July 6 in a fall from a single-seater scout plane at about 600 ft. Major Mitchel went to the field in Louisiana from San Diego, Cal., about three weeks ago. He became a flyer for the Army after his defeat last fall for re-election as mayor of New York. He would have been thirty-nine years old July 19

twenty motor trucks between this city and Baltimore, connecting there with sixty 5-ton trucks owned by the Beam-Fletcher Co. and operating to New York and nearby points. The Beam-Fletcher Transportation Co., operating out of Philadelphia, has made a joint rate agreement with the Maryland Fast Freight Co., which operates between Baltimore and Washington, and expects to maintain 2-hr. service between these points.

The largest merchants in Washington and the Navy Yard contractors are using the new service extensively, many of the merchants having purchased stock in the company. All kinds of freight will be handled both large and small and delivered direct to the consignee. Points covered will include Washington, Baltimore, Philadelphia, New York, Easton, Allentown and Bethlehem in Pennsylvania, and Alexandria, Virginia. The complete trip from Washington to New York will be made in 38 hr. The time from Baltimore to Philadelphia is 12 hr.

WOULD AWARD TRANSATLANTIC

Washington, July 5—A prize of \$50,000 to be awarded by the Government of the United States to the first flyer to cross the Atlantic to England by any reasonable direct aerial route is proposed in a joint resolution introduced in the House this week by Representative Lunn of New York.

BADGES FOR INDUSTRIAL WORKERS

Washington, July 6—War badges for industrial workers employed at least four consecutive months in Government war industries will be issued through the U. S. Employment Service according to a new plan just announced. The badges will comprise some design, not yet completed, of service bars. They will be given to workers in those industries where work is in sufficient volume and importance to require the supervision of a Governmental official or a plant certified by the chief of a Government department as sufficiently important in war work to merit badges. This plan will be under C. T. Clayton, assistant director general of the U. S. Employment Service, who has been designated chief of the War Badge Board.

CHESTER USES TRUCK SERVICE

Chester, Pa., July 5—A new motor truck service with terminals in Philadelphia, this city and New York, with stops at other points, has been established here and a bureau opened for return loads and other information relative to motor trucking, through the Manufacturers' Association of Delaware County in co-operation with the Citizens' Transportation Co., Inc., which has received the indorsement of the association in transporting merchandise. The sole purpose will be to furnish a dependable bonded service on a uniform and reasonable basis of rates.

A fleet of fifty or more motor trucks is at the service of citizens, whether members of the manufacturers' association or not. The trucks used are Rikers, and Pierce-Arrows, with trailers. In connection with this service, there is also a local delivery system. The equipment for this will be to operate between rail and water terminals and the plants or stores, as well as picking

up and delivering from and to the company's loading platforms. At Philadelphia and New York similar local delivery service is being established, affording a door-to-door service, for which regular tariff rates will be applied.

In addition to the through service by trucks alone, connections are being made with water and rail lines for through shipments between the points mentioned. By this embargoes at Chester may be overcome by routing freight by truck via Philadelphia and from that point by rail or the new barge line to New York.

EMERSON MOTORS CO. CONVICTED

New York, July 5—The Emerson Motors Co., Kingston, N. Y., and four of the brokers who sold its stock have been convicted by a jury in the Federal district court for using the mails to defraud. President George A. Campbell; his son George Campbell, who is treasurer; George B. Gifford, a director; and Will H. Stetson, a promoter, were found not guilty. All of these individuals, as well as the Emerson company, were tried on an indictment of thirteen counts.

TO STANDARDIZE SOLID TIRES

Akron, Ohio, July 8—At a recent meeting of the War Service Committee, division of solid tires, the following classification of pressed-on solid tires was adopted tentatively:

Class A Perma- nent Standard	Class B To be dis- continued Nov., 1920	Class C To be dis- continued Nov., 1919	Class D To be dis- continued Nov., 1918	Class E To be dis- continued at once
32x3 1/2	32x3 1/2	32x2 1/2	42x5	34x7
34x4	32x3	34x3	42x6	34x8
34x4 1/2	34x3	34x3	42x6	40x8
36x4	36x3	42x7	34x10	
34x5	36x3 1/2	42x10		
36x5	32x4	36x12		
40x5	38x4	42x14		
36x6	40x4			
40x6	38x5			
36x7	38x6			
36x8	38x7			
36x10	40x7			
40x10				
40x12				
40x14				

Although this classification has not been adopted finally, it is entirely probable that it will be at a later meeting, the definite date of which has not been announced.

Gas Exports Increase 4,250,000 Gal.

Shipments for April of 1918 Show That Difference Over Period Year Ago

NEW YORK, July 5—The United States exported 4,250,000 gal. of gasoline more during April than it did during April, 1917, and for the ten months ending April, 1918, the increase was nearly 25,000,000 gal., as compared with a similar period in 1917. France received nearly a third of the 20,862,303 gal. exported in April, 1918, the United Kingdom next with approximately a fourth and Canada and Cuba next with a seventh each. Here are the export figures for April, 1917 and 1918, and for the ten months ending April 1918:

	April, 1918 Gal.	April, 1917 Gal.
France	6,177,093	5,267,106
Italy	1,588,900	4,712,698
United Kingdom	4,527,365	.....
Canada	3,334,560	1,274,684
Panama	54,104	100,950
Mexico	38,658	57,374
Cuba	3,086,913	35,895
Argentina	10,000	598,971
Brazil	111,100	547,850
Uruguay .....	.....	50,000
Venezuela	157,165	132,452
Australia	448,400	600,750
New Zealand	657,810	1,884,194
Philippine Islands .....	.....	100,000
British South Africa .....	.....	339,450
Other countries	670,235	901,756

Total	20,862,303	16,604,130
Ten months ended April, 1918-1917:		
France	48,646,118	52,056,033
Italy	26,651,703	12,318,071
United Kingdom	56,818,949	48,252,299
Canada	23,207,667	17,525,387
Panama	1,210,309	792,367
Mexico	952,433	449,955
Cuba	6,037,328	1,207,811
Argentina	2,139,586	2,025,294
Brazil	4,666,648	4,658,968
Uruguay	400,020	193,400
Venezuela	436,985	675,337
Australia	6,839,215	6,123,220
New Zealand	6,008,459	5,747,054
Philippine Islands	1,496,604	2,187,580
British South Africa	2,414,240	3,081,930
Other countries	9,624,375	15,862,561

Total

ARMY SHOP NEEDS MECHANICS

Chicago, July 5—Fort Sam Houston, Tex., has sent out a call for motor car mechanics. Commissions are available for

men who qualify. The repair shops at Fort Sam Houston are designated to care for the motor transportation of the Army south of Kansas and west of the Mississippi river. There is an urgent need for men with the following experience just now:

Motor car repairer	Welder
Battery repairer	Wheelwright
Blacksmith	Mechanical motor car
Carpenter	repairer
Mechanical engineer	Mechanical wood
Machinist	worker
Machinist helper	Motorcycle repairer
Magneto repairer	Harness maker
Cook	Harness maker helper
Painter	Motor car mechanic
Sheet metal worker	helper
Plumber	Motor vehicle inspec-
Tool maker	tor
Motor car trimmer	Machine tool inspec-
	tor

Any man, whether in the draft age or otherwise, who has had experience along these lines, may apply and can obtain full particulars from the Commanding Officer, Quartermaster Mechanical Repair Shop No. 304, Fort Sam Houston, Tex.

JULY PRICE CHANGES

Chicago, July 8—The following price changes have been reported this week:

	New Price	Old Price
Hawkeye, 1 1/2-ton	\$1,900	\$1,850
2-ton	2,500	2,250
Glide, light six, 5-pass.	1,595	1,495
4-pass.	1,595	1,495
Briscoe ..	885	825
Templar	2,185	2,085

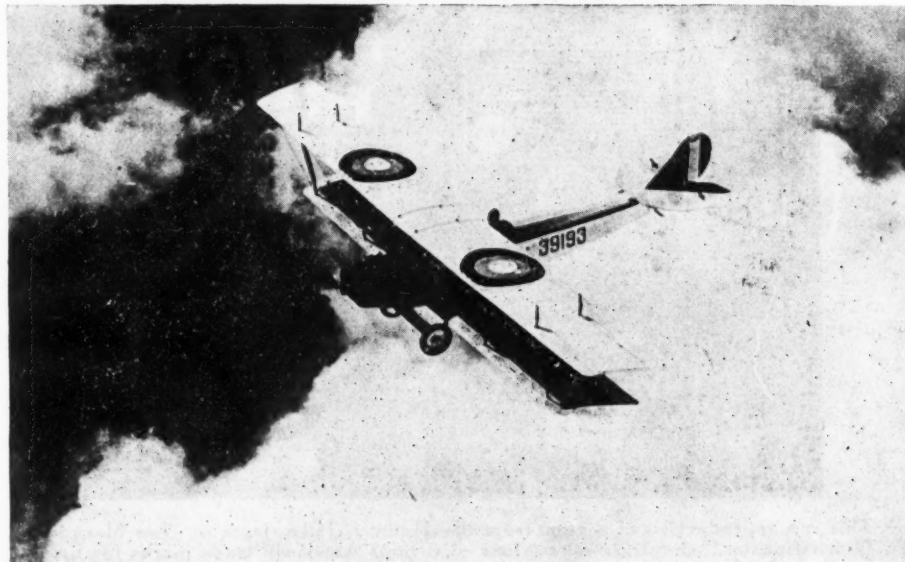
Those reported last week are:

	New Price	Old Price
Chandler, 4-pa's., 2 door	\$1,795	\$1,595
4-pass., 4 door	1,875	1,675
7-pass.	1,795	1,585
Coupe	2,395	2,195
Sedan	2,495	2,295
Limousine	3,095	2,895
Cole, 2-pass.	2,595	2,395
4-pass.	2,595	2,395
7-pass.	2,595	2,395
Coupe	3,795	2,495
Sedan	3,595	2,795
Comet, 7-pass.	1,685	1,285
Cunningham, 142-in. wheelbase ..	6,000	4,750
Kline, 2-pass.	1,595	1,495
4-pass.	1,595	1,495
5-pass.	1,595	1,495
Liberty, 2-pass.	1,485	1,385
4-pass.	1,485	1,385
5-pass.	1,485	1,385
Moon, 6-36, 5-pass.	1,395	1,295
4-pass.	2,250	1,985
5-pass.	2,250	1,985
Paterson, 4-pa's.	1,495	1,295
7-pass.	1,495	1,295

All Cadillac open cars are now \$3,220 instead of \$2,970; brougham five-passenger, \$4,090 instead of \$3,840; victoria, \$3,615 instead of \$3,365. The 125-in. chassis is \$2,690 instead of \$2,490; 132-in., \$2,770 instead of \$2,571; 145-in. \$2,810 instead of \$2,610. The town limousine is \$4,360; town landaulet, \$4,510; landaulet, \$4,495. The last three went up \$200. The limousine is \$4,395 now instead of \$4,145.

WOELFEL LEAVES N. A. A. A. J.

Chicago, July 8—George Woelfel, Jr., secretary to Commissioner William M. Webster of the National Association of Automobile Accessory Jobbers, has resigned and will leave the work of the jobbers' association July 13. George, as he is universally known to the membership of the association, has become a familiar part of conventions through his duties on the platform as an efficient aide to the commissioner.



To conform with Allied airplanes the markings on U. S. planes have been changed to three concentric circles, white, red and blue

Food Directors Endorse Rural Express

Trucks to Provide Direct Link Between the Home Canners and Fruit Producers

WASHINGTON, July 5—State food administrators are endorsing and co-operating with the establishment of motor truck rural express lines throughout the country. Local surveys are made of the communities in which there is need for regular daily service for farmers to and from the market and shipping centers, and the Highways Transport Committee of the Council of National Defense is receiving a prompt response to its suggestions from all interested in the movement of perishable food products to shipping and consuming centers. This plan will relieve farmers considerably of much of the task of hauling and allow them to devote more time to actual production thus somewhat alleviating the labor shortage.

Various sections of the country report that farmers have been inclined to decrease production of perishable food stuffs owing to the time required for hauling to markets, and small lots of fruits, vegetables and other produce which could ordinarily be marketed have been left on the farms because of labor shortage. The rural express, gathering up such produce and delivering it promptly to market, is doing much profitable work for the farmer, rural express and the consumer.

Fruits by Trucks

A plan has been developed in the vicinity of this city by which motor truck loads of fruits and vegetables for canning will be delivered directly from the producers to the canning club centers in the city and sold at wholesale to members of these clubs for canning in the home, insuring an increase in home canning, which the Food Administration urges, and facilitating movement of perishable produce in addition to affording relief to the local freight and express congestion which these shipments would otherwise increase.

Food administrators of Arizona and Mexico, where there are no short-line railroads serving the valleys, are aided by the adoption of motor truck hauling to bring to market the great quantities of perishable produce from those vicinities.

Arrangements are being perfected in several important fruit-growing sections to supplement the usual shipments of fruit by rail by using fleets of motor trucks during the rush period of fruit harvest. Surveys conducted by the Highways Transport Committee show that trucks can be made available for this work and all that is required is that steps be taken to mobilize them promptly when needed. It also has been found that many trucks owned by farmers now are used only a few days a week, and in many instances arrangements can be made to have these trucks used to haul perishables in an emergency.

TANK CARS SPEED UP

New York, July 5—By way of alleviating the fuel situation through a more rapid and wider distribution of fuel oil, refiners are inaugurating with the assistance of the

railroads an express movement of tank cars. Cars are moving as far as 300 miles a day as compared with a general average of 27 to 40 miles per day last winter. At the present time fuel oil stocks are practically normal. The Oil Division of the Fuel Administration is urging that users of fuel oil fill their available storage as quickly as possible and create a reserve stock to be used next winter.

CANADIAN FORD WORKERS OUT

Ford City, Ont., July 8—About 2700 workmen of the Ford Motor Co. of Canada were thrown out of employment when the plant closed its doors at noon Saturday for an indefinite period. The shortage of materials is said to be one reason for the shutdown. The plant has used the large stock of raw material imported before extra duties were placed on such articles by the Canadian government, and other stocks are said to be unobtainable. Officials would make no statement other than it is their

usual custom to close the plant every summer for an inventory lasting two weeks or more. The shutdown is considered a lock-out by the employees, who recently made demands on the company for increased pay amounting to 62½ cents an hour, or \$5 for an 8-hr. day. More than 3000 men will be affected, as the plants of the Fisher Body, Kelsey Wheel and Dominion Stamping companies, which are engaged in turning out parts for the Ford company, will be placed either on curtailed production or enforced layoffs. It is probable that the Canadian government may take over the plant for munition work.

STANDARD TESTS FOR GLARE

New York, July 8—New York state has made a long step toward the solution of the headlamp problem. After months of preparation, and following extensive testing and consultation with the Society of Automotive Engineers and the Society of Illuminating Engineers, a standard method of testing glare eliminating devices has been developed. It is a method which eliminates mere opinions and substitutes a solid foundation of scientific facts for the indisputable classification of headlamps under two divisions: (1) those that glare; and (2) those that do not glare.

The New York State law, which makes



This is a reproduction of a page from the January, 1916, issue of "Les Marques Internationales," showing registrations of various American trade marks for tires that were effected by an enemy alien, Richard Mittler of Vienna, Austria, in thirteen countries. The State Department is considering what measures can be taken to recover trade marks which have been pirated by Germany or its ally

compulsory the elimination of glare provides also for the testing of headlamps by the secretary of state. The secretary of state, following a conference between makers of glare eliminating devices and representatives of the S. A. E. and the Society of Illuminating Engineers, has laid down the following specifications to which devices must conform to be acceptable:

1—The candlepower must be at least 1,200 at a distance of 200 ft. in front of the car and at a point between the roadway and 42 in. above it.

2—The candlepower must not exceed 2,400 at a distance of 100 ft. in front of the car and at a point 60 in. (or any higher) above the road.

3—The candlepower must not exceed 800 at a distance of 100 ft. in front and 7 ft. to the left of the center of the car at a point 60 in. above the road.

So far as is known, New York state is the first of the many with headlamp-regulating statutes on their books to enact a law providing for measurement tests according to recognized and exact methods.

The specifications for headlight tests will be given in full in next week's issue.

FORD TO BUILD SHIPYARDS

Washington, July 5—Henry Ford will build a large plant at Kearney, New Jersey, for the manufacture of submarine chasers for the Navy. It is said that this will be the largest plant of its kind in the world. The first of the Ford chasers being completed at Detroit will be delivered next month.

MORE FORDSONS FOR HERRING

Des Moines, Iowa, July 6—C. L. Herring, Des Moines Ford distributor, who has handled the Fordson distribution for Iowa and parts of other states, has closed a new contract to distribute 5000 Fordsons in Iowa, South Dakota and Nebraska. The first contract was on a basis of 1600. An increase of \$100 over the price asked at the original distribution through the State Council of Defense is announced. The Herring Motor Co. has increased its capital stock to \$800,000.

RECORD ORDER FOR FORDSONS

Dearborn, Mich., July 5—The state of California, through W. M. Hugson, a Ford dealer, has placed an order for 2500 Fordson tractors. This is the largest order ever placed by any one of the United States. Louisiana, Mississippi and Oregon each have ordered 1000 Fordsons. According to the contracts the orders must be filled within one year, dating from July 1, 1918. Hereafter no contracts will be accepted for state distribution for less than lots of 1000. Henry Ford & Son produced 113 tractors Tuesday and 110 Monday. The company expects to bring its daily production up to 125 during the current month.

JOHNSTON IS VICE-PRESIDENT

New York, July 8—R. H. Johnston, who has been manager of the New York branch of the White Co. since 1910, and has been actively connected with the company for the last fifteen years, has been elected a vice-president. He will immediately transfer his headquarters to Washington and is to be succeeded as New York manager by William H. Moore of Pittsburgh.

Durant Takes Sweepstakes at Tacoma

Hearne Takes Third Race in July 4 Card of Events in West and Ranks Second

TACOMA, Wash., July 4—Special telegram—In the Liberty sweepstakes here to-day Durant in a Chevrolet was winner of both first and second races and second in the third. In the 25-mile Durant quickly took a long lead. Hearne in a Duesenberg was second, followed closely by Pullen in a Mercer, Lewis in a Duesenberg and Cooper in a Stutz. This order followed until the seventh lap, when Pullen passed Hearne, taking second place. He was compelled to slow up in the ninth, however, on account of a faulty plug. In the eleventh Lewis overtook Hearne, which made him finish second.

In the second event, the 50-mile, the cars got away to a pretty start with Durant leading the first lap, closely pursued by Lewis with Cooper third. Pullen went to the pits in the second lap with a faulty spark plug and was compelled to withdraw. Durant's car, running perfectly, helped to widen the lead over the rest of the field in the fourth lap, with Cooper gradually dropping behind. Lewis lost second place to Hearne through a bad front tire. Cooper was fourth.

The 75-mile started off with Durant 200 yd. ahead at first and the order about as in the previous events—Lewis, Hearne, Cooper and Pullen. In the second lap, Pullen with a new spark plug, caught and passed Cooper. In the third lap Pullen drew up with Lewis and Hearne, and the three fought for places as the field swept by the grandstand. In the fourth lap Lewis dropped from second to fourth place on account of a bad front tire, and Hearne and Pullen were racing at dead heat.

Lewis changed the first tire of the day in the sixth lap in the record time of 17 sec., but it cost him a lap. Pullen made the sixth lap at 97.29 and continued to increase his speed until he caught and passed Durant in the eleventh. At 25 miles Durant held the lead by a narrow margin, with Pullen second, Hearne third, Cooper fourth and Lewis one lap behind. Pullen was forced to the pits in the eighteenth to change a right rear tire. When the 50th mile was reached Durant was being closely pressed by Hearne with Pullen third and Cooper running smoothly in fourth. Pullen was forced to the pits again in the twenty-fifth with a tire. Hearne took the lead in

the twenty-seventh lap, when Durant stopped at the pits to change the right rear tire. Fast work by the pit men failed to enable Durant to make up lost seconds, and Hearne was never headed.

The attendance was estimated at 45,000. The weather was ideal, and there were no accidents. The crowd was enthusiastic but disappointed in its old favorite Cooper. The prizes were awarded according to points. Durant, with thirty-three points, received \$3,300 plus the \$3,000 grand prize; Hearne, thirty-two points, \$3,200; Cooper, twenty points, \$2,000; Lewis, nineteen points, \$1,900; Pullen, twelve points, \$1,200.

5000 B TRUCKS TO DATE

Washington, July 6—Slightly more than 5000 class B standard Army trucks have been produced and delivered to the Government to date. Production of the B truck, which is 3-ton capacity, is between seventy-five and 100 per day. Production has been slightly hampered by some delays in parts manufacture.

RUMORS LAID TO PRICE FIXERS

Washington, D. C., July 5—The Federal Trade Commission in a report made public to-day announces that many reports have been circulated that the supply of gasoline was endangered to maintain the high price of that product and the heavy profits from it. The commission also finds that the price fixing plan of the Government has created unprecedented profits for the low cost steel mill operations.

"CAFETERIA" CAR SERVICE

Boston, Mass., July 6—Some of the Boston dealers are considering a plan whereby owners of cars can come into the service stations and work on their own cars in need of repairs. Due to the shortage of labor it is not possible to get men enough to do the work as promptly as before. The dealers feel that if the owners know that they can use the tools and have some one give a helping hand in suggestions and a lift now and again with heavy work the motorists will be glad to pay something for being given this privilege.

CANADA PLACES REO CONTRACT

Lansing, Mich., July 5—The Reo Motor Car Co. will deliver under contract to the Canadian government 185 Reo speed-wagons, eighty-five of which will be used for ambulance purposes. For ambulance work the government buys only the chassis, fitting on its own ambulance bodies. The remaining part of the contract will be used for general transportation purposes in hospital work. The speed-wagon ambulances will transport wounded men from the transports to hospitals in the interior. The delivery of the Reo speed-wagons will mean 400 such vehicles now in government service in the Dominion.

Finish of Races

DRIVER	25-Mile TIME	M.P.H.
Durant	15:09.4	98.9
Lewis	15:28	96.9
Hearne	15:30	96.7
Pullen	15:32.2	96.5
Cooper	17:43	84.6
50-Mile		
Durant	30:37.6	97.9
Lewis	31:35.8	94.8
Hearne	31:38.6	94.9
Cooper	31:41	94.6
Pullen out in second lap.		
75-Mile		
Hearne	47:43.5	94.2
Durant	47:58	93.7
Cooper	48:50	92.3
Pullen	49:30	90.9
Lewis three laps behind.		

Rules for Tractor Demonstration

Regulations Show There Will Be No Competitive Features at Salina or Publicity of Results

CHICAGO, July 8—The tractor demonstration committee of the National Tractor & Thresher Manufacturers' Auxiliary of the National Implement & Vehicle Association has announced the rules and regulations which will govern the National Tractor Demonstration at Salina, Kan., July 29-Aug. 2.

All competitive features will be eliminated, although provision is made for any individual manufacturer who desires to have tests made, which will be official as far as he is concerned. The results of the tests will not be announced by the association but will be the property of the exhibitor alone and may be published as official by the exhibitor if he so desires.

Doubtless some tests will be made and the results will be valuable as far as they go, but it is a matter for regret that they will not be made public, as the tractors at Salina will be working practically under uniform conditions and tests would indicate something about their relative efficiency. The buying public has a right to know something about this and in time it is to be hoped that the management of the national demonstrations will recognize this fact.

Entries reported to date are those by the Avery Co., Peoria, Ill.; Square Turn Tractor Co., Chicago; Hart Parr Co., Charles City, Iowa; Holt Mfg. Co., Peoria, Ill.; Nilson Tractor Co., Minneapolis, Minn.;

Moline Plow Co., Moline, Ill.; Dauch Mfg. Co., Sandusky, Ohio; Parrett Tractor Co., Chicago; The Russell Co., Massillon, Ohio; Gile Tractor & Engine Co., Ludington, Mich.; Advance Rumely Co., LaPorte, Ind.; Aultman & Taylor Co., Mansfield, Ohio; Rock Island Plow Co., Rock Island, Ill.; Gray Tractor Co., Minneapolis, Minn.; LaCrosse Tractor Co., LaCrosse, Wis.; P. & O. Plow Works, Canton, Ill.; Oliver Chilled Plow Works, South Bend, Ind.; John Deere Plow Co., Moline, Ill.; Grand Detour Plow Co., Dixon, Ill. Indications are that the accessory exhibit will be much larger this year than it has ever been in the past.

The rules and regulations are given herewith.

Rules and Regulations for National Tractor Demonstration

1. Public demonstrations shall begin at 1 o'clock and end at 3 unless other hours are announced by local committee at least 24 hr. before starting time. Private demonstrations may be held in the forenoon from 8 o'clock to 11:30.

2. No exhibitor shall be allowed more than one tractor of each size and type on the field during the public demonstration doing the same kind of work. He may have one or more machines performing different operations, namely, one plowing, one disking, one seeding, etc.

3. Size of land for each tractor exhibitor for plowing demonstrations will be determined by the average number of plow bottoms pulled, the width of plows and speed of machine as given in company's catalog. Each tractor exhibitor must plow out dead furrow to its left.

4. All plows on any given gang must be set at the same depth and kept there during the day's demonstration. This depth will be announced daily by general manager. (Plows found operating otherwise will be ordered from the field for the balance of the day's work.)

5. All exhibitors will be allotted land in the same field or adjoining fields during each day's demonstration. Land for private demonstration will be provided daily, in one field or adjoining fields.

6. In all public demonstrations, the motor or tractor must not be run at more than 10 per cent above its catalog plowing speed. Tractors may be run on high gear with normal engine speed when disking, harrowing, seeding, etc.

7. Positions on field first day will be arranged by lot, in following manner:

Drawing for Monday

Drawing to take place at 10:30 a. m., Monday, the opening day of demonstration, by serial numbers representing total number of exhibitors.

Position on field for first public demonstration will be according to numbers, starting 1, 2, 3, 4, etc.

The total number of exhibitors will be divided into same number of divisions, A, B, etc. A will occupy preferred position on first day public demonstration, and B preferred position on second day, etc.

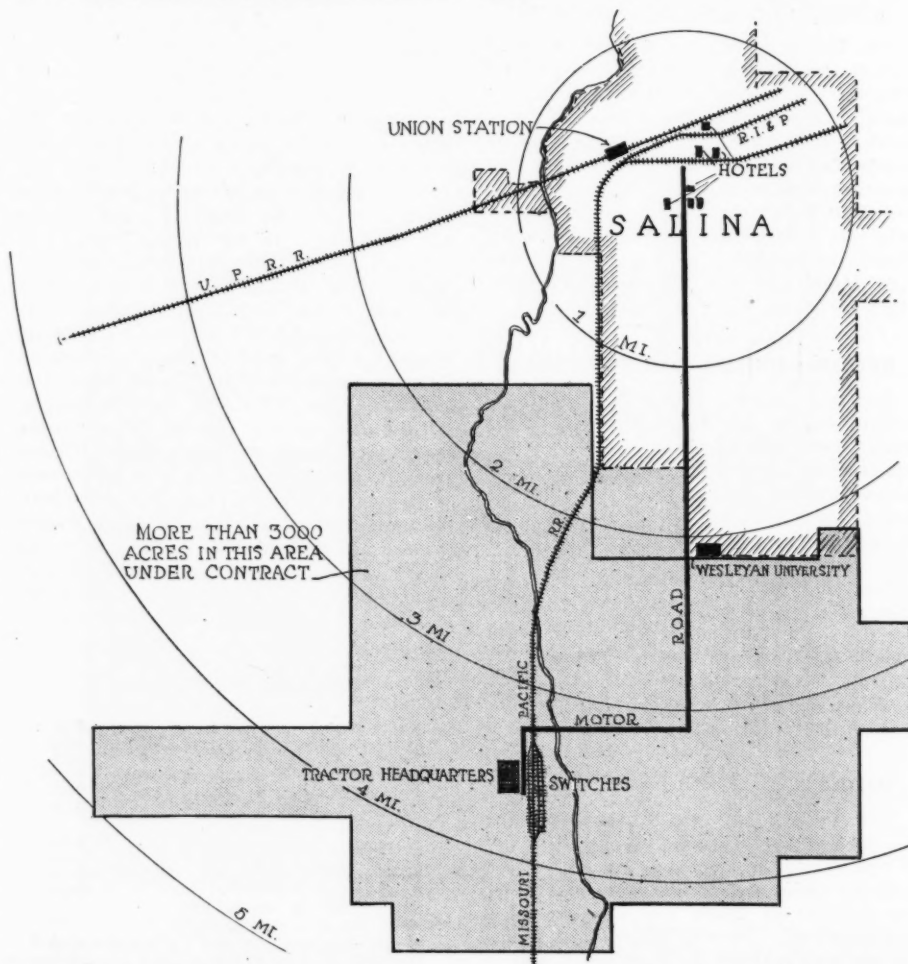
Exhibitors who do not have representatives at drawing.—The drawing will be done for

him under direction of the general manager.

Each exhibitor will be required to finish his land daily in a workmanlike manner, and assist in plowing the end lands as directed by the general manager.

8. Each field plowed will be surveyed and staked ready for afternoon demonstrations.

These fields will be tested for the drawbar pull of a 14-in. plow, plowing at the specified depth previous to the demonstration. All manufacturers will be furnished information relative to drawbar pull so they can better determine the number of plows to use on each gang.



Map of Salina, Kan., where National Tractor Demonstration will be held, showing location of hotels and tractor grounds

9. Each tractor shall bear a placard, to be furnished by the chief observer, showing the brake horsepower of the engine, the revolutions per minute, the plowing speed in miles per hour and the kind of fuel used and its Baume test. Tractors using more than 5 per cent of gasoline shall be classed as burning gasoline and be so placarded.

10. All tractors on the demonstration field belonging to one exhibitor must be kept on or along the land allotted him for that day's demonstration, until the hour designated by management for returning to headquarters.

11. No machine will be allowed to operate with special equipment other than that designed for practical use with the same. No spectacular methods will be permitted on the part of salesmen, or others, to attract crowds. The demonstration must speak for itself.

12. Each tractor exhibitor will have the privilege of burning any kind of fuel he desires, but no one will be permitted to burn fuel of higher gravity test than that used by his competitor burning the same kind of fuel. All exhibitors will be required to obtain fuel from one source, such to be designated by general manager.

13. No time will be required of exhibitors to make movie pictures or group photographs for commercial purposes. Manufacturers can arrange to get photographs during the demonstration if they desire. Any manufacturer or representative of farm or trade papers, or news agency, will be allowed to have their official photographer on the grounds to get pictures for their own use.

14. Manufacturers will be privileged to make brake horsepower, drawbar pull and such other efficiency tests as they desire. All such tests desired should be reported to the general manager not later than July 15 so that sufficient number of prony brakes, dynamometers and other apparatus can be provided.

These early announcements will also be necessary in order that a suitable number of competent judges and sufficient acreage can be provided for all who desire to make tests.

15. The results of all tests made at the demonstration shall be furnished to the exhibitors only and such exhibitors may publish the results as official from the management of the demonstration. No official report of any tests made will be kept by the general manager, judges or the association except by permission of the exhibitor making the tests.

Belt-driven Machines

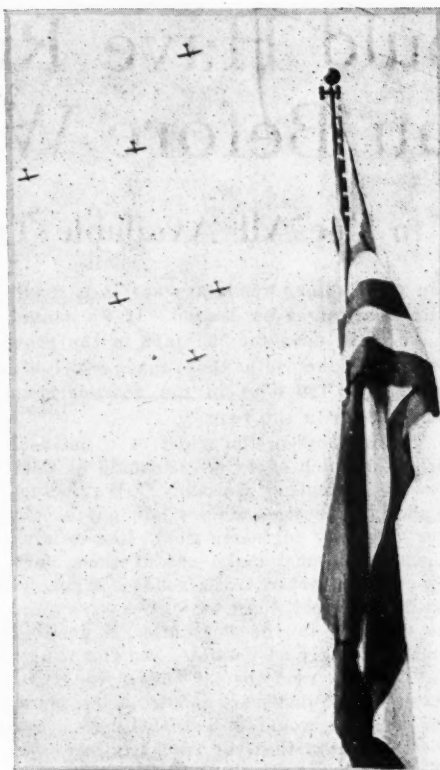
16. Manufacturers will be privileged to exhibit not more than two belt-driven machines in connection with their exhibition.

17. Arrangements will be made for daily demonstrations showing use of tractors harrowing, disking, seeding, and other farm operations, demonstrating general utility of the tractor. The rules governing these demonstrations will be the same as those applied to plowing.

18. The interpretation and enforcing of these rules shall be left to the local manager of each demonstration and the general manager of the demonstrations.

19. Each company exhibiting at these demonstrations shall appoint one manager who will be expected to report to the general manager not later than 8 o'clock each morning for instructions and information regarding the day's work. This manager of exhibits will be held accountable for the work of his company and no instructions will be issued to anyone else, nor will requests, instructions, or complaints be recognized from anyone but this exhibit manager. He shall wear a badge furnished him, specifying his being official exhibit manager.

20. Each exhibitor will be expected to keep plows, tractors, etc., around his tent arranged in first class order, and the land allotted him for exhibition purposes free from circulars, rubbish, etc., such as will be dis-



United States planes with Liberty engines flying in battle formation July 4

tributed around headquarters daily. They will also be expected to use care at all times in operating machinery with respect to its safety for all visitors. The management will appreciate co-operation of these exhibit managers in all matters.

21. Each entrant will sign the rules and thereby agrees to live up to the rules and co-operate with the committee in every way to make the tractor demonstration a success.

22. The field manager shall have authority to order from the field any machine whose operator does not comply with the rules, and, further, any exhibitor who is manifestly disregarding the rules will not have land laid out or furnished for him on the succeeding days, or until such time as he has met the conditions.

23. No exhibitor joining the National Demonstration will be permitted to exhibit until he has given correctly the price that he is in position to furnish tractors at regular production, the correct weight of tractors and all data pertaining to their construction and rating, minimum and maximum speed at which the motors are to run, and the committee have the right to have any such machines placed under test to prove the correctness of the data that is furnished.

K. C. Has Truck Bureau

Territory in 75-Mile Circuit of Kansas City Gets Return Loads Service

KANSAS CITY, Mo., July 5—A return load bureau has been established in Kansas City for territory within 75 miles by A. S. Austin, manager of local sales of the Republic. The project was instituted July 1 at a meeting of thirty truck owners called by Mr. Austin. Business placed by

the bureau has averaged around \$150 a day since, though it is realized that this level may not be maintained.

H. M. Genung, manager of the H. A. Dougherty Motor Co., distributor of Republic trucks, and Mr. Austin decided to establish a bureau to try out the idea. They got their first information from Republic owners of the territory, through the agents, securing a considerable list of names as the nucleus of their truck business exchange. P. Gibbons, for several years with the Auto Truck Transfer Co., Kansas City, previously with another transfer company, has been employed to manage the bureau. Mr. Gibbons prepared data on the available routes out of Kansas City to towns where business might originate or to which much Kansas City wholesale business went. He interviewed many wholesalers and manufacturers and discovered that they would welcome the development of truck transport service.

From truck owners he learned that they would give the use of their trucks at the rate of \$1 a mile when two or three men were needed to handle furniture and similar objects; that most of them would hire out their trucks with drivers at \$2 an hour.

On the basis of \$2 an hour, his display to the truck owners showed that trips to towns as far as 40 miles from Kansas City could be made profitably at the new freight rate, with a small extra charge to correspond to cartage.

For instance, Buckner, Mo., on a rock road, 22 miles from Kansas City, has had a freight rate of 33 cents on groceries. The new freight rate on these commodities to Buckner is 41½ cents. Adding a 10 cents per 100 lb. charge, which corresponds to cartage, gives a charge of \$20.60 on a 2-ton load. At a maximum estimate of 6 hr. to make the round trip—with a load only one way—the truck owner would receive \$8.60 beyond his normal charge of \$2 an hour.

Estimates on Dirt

Similar estimates were made on a longer haul, to Lexington, Mo., over a dirt road. The distance is 42 miles; the old freight rate is 39 cents, the new rate 49 cents per 100 lb. Adding the cartage charge of 10 cents per 100, the revenue for a 2-ton truck one way would be \$23.60, and a very moderate return load would provide abundant net returns to the owner.

Thirty-five truck owners are listed, practically all of them in Kansas City. These include the large transfer companies and one or two comparatively small trucks of express bodies. The bureau is established on a commercial basis. A commission of 10 per cent will be paid by truck owners on the business provided them by the bureau. This arrangement was completely satisfactory to the truck owners who attended the meeting July 1.

Frank Davis, chairman of the good roads committee of the Kansas City Automobile Club, is planning the fullest co-operation with the return load bureau. The immediate service of the club is in the providing of information on routes and condition of roads. Members of the transportation and good roads committee of the chamber of commerce also now are trying to bring about the closest co-operation with it.

Chicago Should Have Return Loads Bureau Before Winter

Duty of Shippers to Use All Available Trucking Facilities

WHILE Illinois is transforming its poor roads into good roads the shippers of Chicago must make use of existing roads if they would assist the Nation in its transportation problems. Chicago must make use of all its transportation facilities during the coming winter, when there will be as many if not more embargoes than were placed last winter. It is probable that there will be more embargoes, for the great volume of war material moving toward the eastern coast for shipment overseas undoubtedly will offset any increased efficiency in Government operation of the railroads. Goods formerly made in the Chicago territory and consumed by soldiers of the draft in that territory will have to be shipped to the Atlantic seaboard, and all these goods will be given preference by all the railroads, while commercial shippers must take their chances.

More Embargoes Probable

Chicago must prepare for embargoes if the merchants are to be able to ship goods this fall and winter. It must prepare now, before the congestion is here, and one of the most ready means of assisting the railroads is highway motor truck transportation. Motor truck transportation between Chicago and adjacent Hammond, Gary, East Chicago, Whiting, Indiana Harbor, Ind., on the east; Evanston, Highland Park, Racine and Milwaukee, on the north; Elgin, West Chicago and Aurora, on the west; and Joliet, Frankfort and Steger, on the south, can be accomplished by the establishment of a return loads bureau in Chicago.

It matters not that the Illinois, Wisconsin

and Indiana roads are not in a condition that might be desired. If we cannot have roads open for 365 days in the year, we must make use of those roads which are open only 180 days in the year or even thirty days in the year.

We are now in the midst of a national crisis in which every effort should be bent toward defeating Germany. We cannot wait until these roads are laid out as our best highway engineers would like to have them. We must make use of them now. Since new motor truck roads cannot be built over-night, those which we have must be repaired in the best manner possible and as quickly as possible, and the trucks put to work over them. This method will result in the necessary repairs being made sooner than would otherwise be the case for the reason that the trucks in use over the roads automatically will prove the economic necessity of such roads. The fact that the famous priority order No. 2, which classified railway construction with jewelry and other so-called non-essential articles and activities, has been repealed, will greatly assist in the resumption of railroad construction.

The Government Highways Committee will assist the Illinois highway officials in their work for increased road-building activity. Since the Government Highways Committee comprises representatives from the War Industries Board, Fuel Administration, United States Railroad Administration, the Highways Transport Committee, the Department of Agriculture and the Motor Transport Service of the United States Army, it is a foregone conclusion that the capitalistic committee which heretofore has been responsible for the inability to proceed with road-building work in

Illinois will be furnished with full information as to the economic necessity of any roads which are being used by motor transport for the haulage of goods overland.

Chicago cannot with reason hold back in the establishment of a return loads bureau on the ground of poor roads, for Virginia, known the country over for its poor roads, or, more properly, absence of roads, is now running several motor truck express lines over them to Washington. It was said that this was impossible, yet it is now an established fact. As soon as Virginia realized the necessity for furnishing foodstuffs to Washington, which now has a population 100,000 greater than at this time last year, it took steps to make the roads passable by grading, scraping and draining. What Virginia has done surely the great state of Illinois can do.

Aside from the patriotic necessity for developing highway motor truck transportation from Chicago to the nearby industrial centers, by the establishment of a return loads bureau, such a bureau should be formed because Chicago has the goods to move and the motor trucks to move them.

Cargoes for Trucks

It has been said that there are no goods to be moved between Chicago and the adjacent industrial cities such as Hammond and Gary in Indiana, Waukegan, Kenosha and Milwaukee in Wisconsin, and Elgin, West Chicago, Aurora, Joliet and Steger in Illinois. People who make this claim evidently do not know what they are talking about. Investigation of the possibilities for motor truck hauling into and out of Chicago on the first day found one concern which alone had 7500 tons of freight yearly which could be transported over the roads by motor trucks. The company is the Chicago Hardware Foundry Co., North Chicago, Ill., and a copy of its answer to questions asked by this magazine is shown in the illustration. It has 6000 tons per year to be moved between North Chicago and Chicago, 1000 tons yearly to Milwaukee and 500 tons yearly to Racine Junction. North Chicago is on a 35-mile circle drawn about Chicago as a center, and is about 25 miles to Racine Junction and about 45 miles to Milwaukee. This is only one company. There must be many others similarly situated, for Chicago has more than 10,000 factories within a 40-mile circle drawn about the center of the city. It has 14,145 factories in cities within 100 miles of Chicago and 20,757 factories in cities of over 10,000 population within 200 miles of Chicago.

In fact, a seventh of the factories of the United States are within 200 miles of Chicago. A circle with a 200-mile radius includes a twenty-fourth the area of the United States, and yet it has a seventh of all the factories in the United States.



The road shown is 15 miles from the city limits of Chicago, but it is a good example of the type of unimproved Illinois roads

EXECUTIVE OFFICE
CHICAGO HARDWARE FOUNDRY RECEIVED
 NORTH CHICAGO, ILL.

E. P. BEDDOWICK
 SECRETARY-TREASURER

ATTENDED TO
 BY *[Signature]*

May 23, 1918.

THE COMMERCIAL VEHICLE,
 239 W. 30TH ST.,
 NEW YORK CITY, N.Y.

GENTLEMEN:

Replying to yours of May 20th, we enclose herewith the forms filled out as requested.

Yours truly,
 CHICAGO HARDWARE FOUNDRY CO.
[Signature]
 Sec'y - Treas.

Are the Goods Available? Yes

The Chicago Hardware Foundry Co. of North Chicago has a total of 7500 tons of goods which could be hauled yearly by motor trucks, according to information gathered by another Class Journal Co. publication. There are other companies which have goods which can be handled by trucks. A return loads bureau in Chicago could help such concerns to get their goods moved and at the same time find other such

C.H.F. Co. #2

1- Have you any goods which you might ship by means of motor trucks for distances of from 25 to 50 miles? If so, to what points and in what tonnage yearly?.....
Chicago 6000 tons per year Milwaukee 1000 tons
Pacine Junction 500 tons per year

2- If you operate your own trucks, do they run empty on the return trips and if so from what points?.....
Don't operate trucks

3- If you could secure loads for these present empty return trips, would you carry them at a fair charge, provided the handling of such goods does not interfere with your own delivery schedule?.....
We have considerable return barrels - Pick ups is for Chi

4- If a competent Return Loads Bureau were established in Chicago, would you co-operate with it by advising it of what amount of goods you have to be moved by trucks other than your own, and to what points?.....
Yes

5- Have you had difficulty in receiving or sending goods to points within a radius of 25 to 100 or more miles from your plant by railroad or trolley express and if so to what points?.....
Chicago

Yours very truly,
 THE COMMERCIAL VEHICLE
Joe Husson
 Editor.

JHO
 CHICAGO HARDWARE FOUNDRY COMPANY
 NORTH CHICAGO, ILL.

The organization intrusted with the establishment of a return loads bureau in Chicago to develop highway transportation in that city, first of all, must conduct a thorough industrial investigation among the Chicago shippers to determine what quantities of goods are available to be shipped over the roads. If one company that has 7500 tons yearly to be moved can be so quickly found many others can also be discovered. This result is sure to follow, for in the development of the return loads bureau work in Connecticut it was at first said that there were no goods to be shipped by motor trucks, yet many hundreds of thousands of tons now are moved over the roads by commercial vehicles.

Chicago also has the trucks available for handling the goods, for 14,835 trucks were registered in Cook county up to and including April 20, 1918. Of these, 9412 were of 1-ton capacity and under, and the remaining 5425 of over 1-ton capacity.

Personnel of Chicago Committee

The organization for carrying on the establishment of the return loads bureau in Chicago has been formed under the Illinois State Council of Defense, and similar organizations have been completed in the adjacent states of Wisconsin and Indiana. The return loads bureau organization in these three should co-operate to the fullest possible extent, since much of the goods hauled out of Chicago will be carried to cities in either Wisconsin or Indiana, and it is necessary for the return loads bureau development to go along simultaneously in Wisconsin and Indiana in order that return loads to Chicago may be secured.

The Chicago Highways Transport Committee, of the transportation division of the Illinois State Council of Defense, is

made up of Henry Paulman, president of Henry Paulman & Co., Pierce-Arrow distributor in Chicago, who acts as chairman, and F. E. Ertsman, secretary of the Chicago Motor Truck Owners' Association, who is the secretary. Other members of the committee include William G. Edens, president of the Central Trust Co.; John H. Winterbotham, mid-western representative of the State Council Section and the Associated Good Roads Associations of Illinois; H. M. Ellison, Packard truck representative in Chicago; G. M. Freeman, of the Walker Vehicle Co.; Leonard A. Busby, president of the Chicago Surface Lines; Britton I. Budd of the Chicago elevated

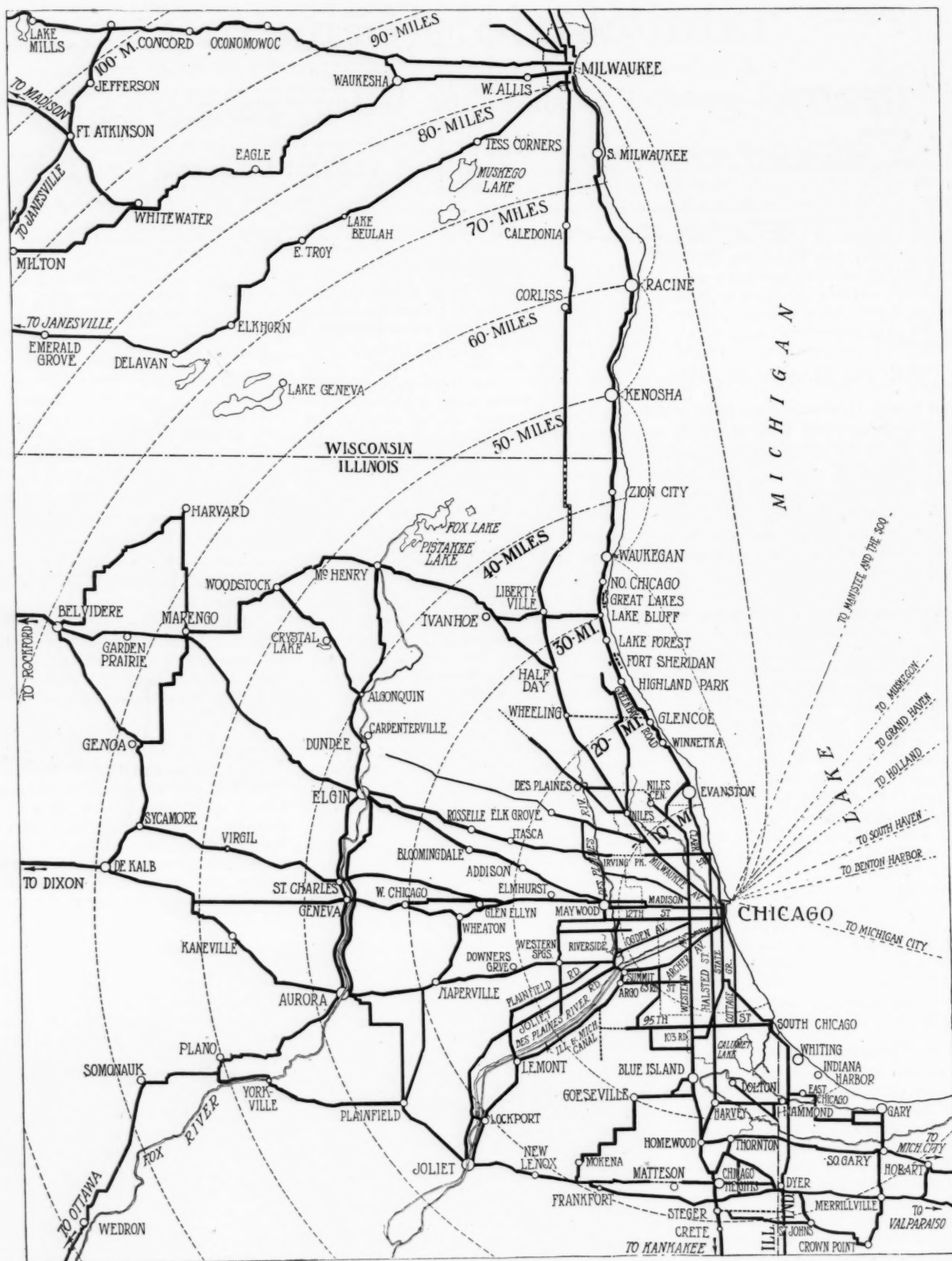
lines; John P. Stockton, president of the Stockton Transfer Co.; Joseph Davis, Winston representative in Chicago; J. Murray Page, Riker truck representative, and C. F. Handshy, general manager of the Illinois Traction Co.

In Wisconsin P. C. Eldridge has been appointed chairman of the Committee on Transportation and Communication of the Wisconsin State Council of Defense, with offices in Milwaukee. William S. Luick, president of the Luick Ice Cream Co. of Milwaukee, is also an active worker on the Wisconsin committee, and is well qualified to pass upon transportation problems, since he already is using motor trucks for



This road is the main route between Hammond, Ind., and Chicago. It is a typical Northern Indiana improved road and has a tarred macadam surface

Roads in Vicinity of Chicago and Adjacent Cities



Present roads over which trucks would have to run in carrying goods overland between Chicago and adjacent cities in Illinois, Wisconsin and Indiana. The heavy black lines indicate hard-surfaced or dirt roads, some of which are in poor condition. The impassable stretch on the Chicago-Milwaukee road, described in a previous issue of Motor Age, is shown by the alternate black and white blocks, and the dotted lines indicate the roads now under construction within Cook county

bringing shipments into Milwaukee. In Indiana I. D. Strauss has been appointed chairman of the Highways Transport Committee of the Indiana State Council of Defense, with offices in Ligonier. Walter D. Winslow has been made secretary of the Highways Transport Committee of the State Council of Defense, with offices in Indianapolis.

All the members of these committees are active workers who should plan their return loads bureau development along the lines pursued in similar activities in the states of Connecticut, New York and New Jersey. Briefly, this work should be laid out somewhat along the following lines, with the steps taken in the order in which they are given:

1. Make an industrial survey among the merchants and shippers in each state to discover what goods are available for shipment by motor trucks and to what points. The committee is well qualified to advise as to the best methods to ship goods by motor trucks and should actually give such a service to the shippers, many of whom will be found to be very set in their ways because of their habit in shipping exclusively by rail. To many of these shippers it will be necessary to actually point out the way in which they can ship their goods more quickly and more economically by means of trucks. In some cases it may be even necessary to help them ship their goods by trucks in order that they may be convinced of the truck's superiority where the time of delivery is of importance.

2. Make an industrial survey of the trucks available for haulage to the nearby cities, finding out what trucks are now engaged in the service, where they run, how often they make trips and the rates charged for the work.

Concerted Drive Next

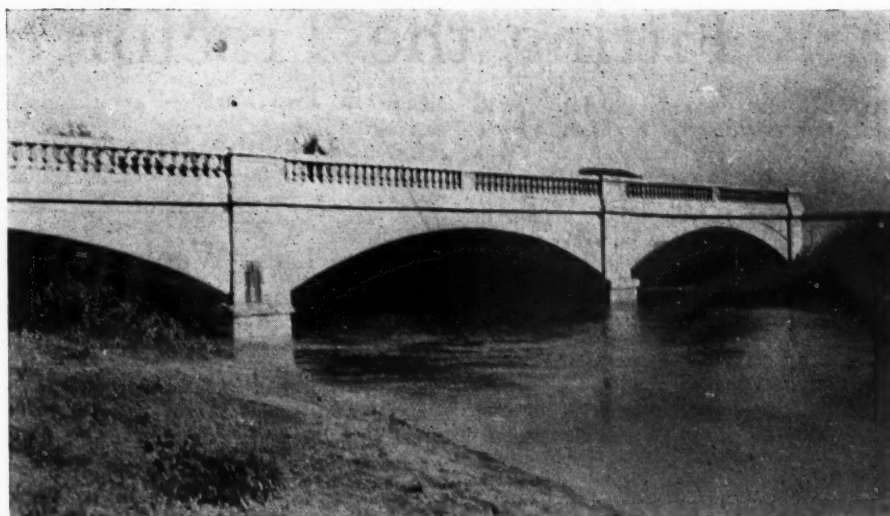
3. After these two surveys have been completed and the data collected analyzed it will be possible to establish a return loads bureau, with lists of both truckers and shippers and to get up these lists in such form as will make them easily usable.

4. A concerted drive must then be made upon all of the Chicago merchants by the personal contact method and by the use of the trade press. The Chicago Association of Commerce, the Chicago Automobile Trade Association and the Motor Truck Owners' Association also can be used to good advantage in such a drive, as well as the associations of hardware men, van owners, laundry men, machine companies and other organizations which represent Chicago's varied industries.

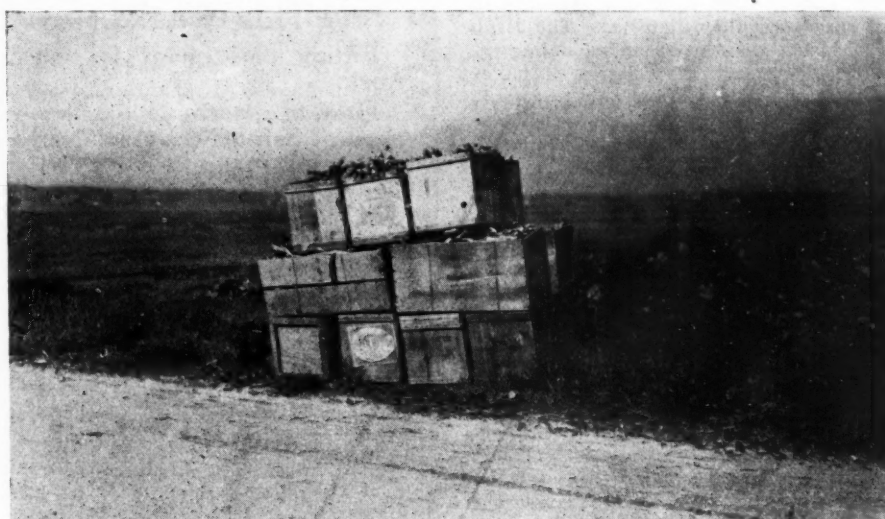
5. As soon as the Chicago return loads bureau has been established and put in working order steps should be taken to co-operate with other similar bureaus already established or to be established in the larger cities in the states of Wisconsin and Indiana.

After the surveys have been completed and the bureaus established the future development of the plan will indicate in which direction, north, west, south or east of Chicago, the work should be concentrated upon at the beginning.

Perhaps the quickest results may be obtained through the trucks operating to the east, to the cities of Hammond, Gary, South Chicago, Whiting, East Chicago and



This is a typical bridge on the roads of Northern Indiana. It is on the main truck route between Chicago and Hammond, Ind.



Here are cases of rhubarb waiting to be picked up from an Indiana farm south of Hammond, Ind., and carried into Chicago, 20 miles away

Indiana Harbor. There are already considerable trucks hauling goods between these points and Chicago, and many of them are running in either one direction or the other with no load. In Hammond and the other cities along the lake shore east of Chicago there are great quantities of steel and iron products which may be moved into Chicago by motor trucks in addition to miscellaneous goods of practically all kinds. Grocery trucks running out of Chicago also deliver goods across the Indiana line, and most of these run back to Chicago empty and are thus available to carry additional goods if suitable loads can be found.

Ten to twenty miles south of the lake front in Indiana is a great agricultural section from which goods may be transported into the Randolph street markets for distribution among Chicago consumers. While in many cases farmers are using their own vehicles to carry their goods into market it would be much quicker and cheaper if they could use a reliable rural express truck service, for such a service would get the goods into the market more

quickly than by horse wagons, and at the same time enable the farmers to remain on their farms.

Such a course would result in greater farm productivity, because all the farmer would have to do would be to haul his goods to the rural express truck route.

After the bureaus have been established in the vicinity of Chicago and the work got under way, steps should next be taken to have provisions made to take the snow off the roads this winter. Until the winter of 1917-1918 this was never thought of until Connecticut pioneered the way.

Massachusetts and New York have now appropriated money for doing the work this coming winter. Besides, the Lincoln highway was cleaned clear through from Detroit and Cleveland to the east and the driveaways of war trucks from the Chicago and Wisconsin plants will assist in getting this necessary work started. Illinois will have to follow suit in removing snow from its main highways and now is the time to get the necessary preliminary organizations under way to accomplish this result.

Fitting the Tractor to the Job

In Two Parts—Part II

By Fred M. Loomis

Motor Age Editorial Staff

IN considering the use of the tractor on the belt for ordinary farm tasks it must be premised that nothing but the most general statements can be made. It happens that in fitting the tractor to belt work, on nearly all the machines which are operated by belt drive, the efficient r.p.m. of the driven machine and the diameter of its pulley must be taken into account because tractor belt speeds vary to such an extent that co-ordination must be figured out for every individual installation. This is because there is no standardization in this matter. Every manufacturer follows his own fancy in determining the r.p.m. of his machines and in fitting them with pulley. Likewise, the tractor manufacturers never have settled upon any standard of belt speed or pulley diameter. The result is confusion worse confounded unless the dealer understands the relation of pulley diameter to belt speed and how to co-ordinate the two. However, it is possible in a general way to indicate, as is done in the accompanying table, the size or capacity of belt-driven machines which a tractor of good belt power rating normally will handle.

For instance, threshing machines are rated by the diameter and length of the cylinder as determining capacity rather than by any other factor. They have, however, a wide range of r.p.m. and where the make of threshing machine which the farmer wants to use with his tractor is known, the drive pulley and the driven pulley must be determined in size by the use of rules subsequently given. If the dealer should be asked, however, to suggest the size of threshing machine which a tractor of a given rating is likely to be able to handle, he will be within safe limits, generally speaking, in making the following recommendations:

Small Thresher

For tractors of 5-10 and 6-12 rating nothing should be used larger than what is known as the small thresher. This is a threshing machine designed to run with very light power and to have sufficient capacity to handle the threshing of the average small farm only. There are some threshers on the market rated at 18 by 36 which a 6-12 tractor can handle. However, it will be safer for the dealer to start with a tractor of 8-16 rating, which is competent to handle threshers rated at 18 by 36 and 22 by 40. The 9-18 will handle a 24 by 42; the 10-20, a 28 by 48; the 12-24, a 32 by 54; the 15-25, a 36 by 60; the 15-30, a 40 by 66; a 20-30, a 40 by 66, while the 25-45 and the 40-65 will handle threshing machines of the largest capacity.

Silo filling is a job requiring a considerable amount of power and one which is coming upon practically every farm in the country. Therefore, the dealer should study carefully the various silo fillers upon the market and acquaint himself with their rating, dimensions and power requirements.

Last Week

How to tell what tractor the farmer needs.

How to tell whether the farmer should have a two-bottom or three-bottom plow.

How to hitch plows and harrows in combinations together.

Drawbar uses of a tractor—to determine the sizes of the equipment.

This Week

Fitting the tractor to belt work.

How to determine the best sizes of belt-driven machines.

Silo Filling.

Huskers and Shredders.

Power Corn Shellers.

Feed Grinders.

Hay Presses.

Finding pulley diameters.

The same consideration must be given here, too, to the belt speed and pulley dimensions. There are so many types and sizes of silo fillers upon the market and they are rated so differently by the manufacturers that it is possible to offer suggestions only of a most general nature regarding the size which the dealer may recommend safely with tractors of known rating. In the following list the width of the feed throat is taken as indicating the size of silo fillers or ensilage cutters recommended with a particular size of tractor. Upon this basis a tractor of 6-12 rating will practically operate a silo filler with a throat width of 8 to 10 in.; the 8-16, 12 in.; the 9-18, 14 in.; the 10-20, 14 to 16 in.; the 12-24, 16 to 18 in.; the 15-25, 18 to 22 in.; the 15-30, 18-22 in.; the 20-30, 22 in.; the 25-45 and larger tractors, silo fillers of 26 in. and up to the largest capacity.

Huskers and shredders, as a rule, are rated according to the number of rolls and are subject to the same considerations already mentioned as regards belt speeds and pulley dimensions, but for most of the huskers and shredders on the market the following classification may be safely recommended:

The 5-10 tractor, 2 roll; the 6-12, 2 to 4; the 8-16, 4 to 6; the 9-18, 4 to 6; the 10-24, 6; the 12-24, 6 to 8; the 15-25, 6 to 8; the 15-30, 8; the 20-30 and all higher-rated tractors, 10 roll.

Power corn shellers are of two varieties, known as the spring and the cylinder. The

spring sheller is rated by the number of holes, while the cylinder sheller is rated by its capacity. Except in extremely small sizes and for small power the cylinder sheller rarely is found upon the farm, there being one or two small shellers of the cylinder type sold here and there. As a rule, however, the farmer will have a common spring sheller, which is to be rated by the number of holes. Still with the same regard for belt speed and pulley diameters the following co-ordination may be recommended:

The 5-10 tractor, 2 holes; the 6-12, 2; the 8-16, 4; the 9-18, 4 to 6; the 10-20, 4 to 6, or a cylinder sheller with capacity of 250 to 400 bu. per hour; the 12-24, 6 hole spring sheller, or cylinder with capacity of 250 to 400 bu. per hour; the 15-25, cylinder sheller with capacity of 500 to 800 bu. per hour; the 15-30, cylinder sheller with capacity of 500 to 800 bu. per hour. Tractors of larger rating are competent to handle any of the larger-capacity cylinder shellers.

In considering feed grinders, regard must be paid particularly to the amount of feed which the farmer normally needs as determining the capacity of the mill he will buy. There is a wide variation in the amount of power demanded by mills of different makes but of the same capacity, but for the types usually found on the corn-belt farms the mills of the following capacities may be recommended for tractors of corresponding rating:

The 5-10, grinding mill with capacity of from 8 to 20 bu. per hour; the 6-12, 8 to 20; the 8-16, 9 to 18; the 10-20, 20 to 30; the 12-24, 15 to 25; the 15-30, 30 to 50; tractors of larger rating are competent to take power grinders with a capacity of 50 bu. or upward per hour.

Various Hay Presses

Hay presses are of all sizes, capacities, speeds and power requirements. In fact, it is a very difficult matter to determine any classification which will be more than very general, and in figuring on hay presses great care should be exercised in determining the co-ordination. However, the following may be suggested as a tentative classification, based upon the size of the bale chamber and the capacity of the press. For instance, a 5-10 tractor can use some makes of baling presses with 14 by 18 chamber measurements and 2 to 3-ton per hour capacity. The same size hay press should be used also with the 6-12. A hay press with a bale chamber of 16 by 18 in. and a capacity of 3½ tons per hour can be operated by a tractor of 8-16 and 9-18 rating. A 10-20 tractor will operate a baling press 17 by 22 with 3½-ton capacity, or 18 by 22 with 5 to 6-ton capacity. The 12-24 and 15-25 tractors can operate a baler 22 by 36 with 9 to 10-ton capacity. Tractors of 15-30 and higher rating very generally can take baling presses of the largest capacity.

Mention has been made of rules which determine pulley diameters. These are important because the manufacturer of belt-driven farm operative equipment, such as threshing machines, silo fillers or power feed mills, design such equipment to run at a uniform and definite speed. Indeed, the full efficiency capacity of these machines cannot be attained if the speed at which they run departs far from that recommended or prescribed by the manufacturer. In fact, a speed too low may destroy the working efficiency entirely, while a speed too high may result in ruining the machine; also, to speed a power-driven machine too high frequently is dangerous. Fatal accidents not uncommonly result.

No Standard

Unfortunately there is no standard to which manufacturers conform. Power units, such as gasoline engines and tractors, are made by manufacturers who commonly do not manufacture the power equipment with which they will be used. Likewise, manufacturers of power equipment commonly do not make the power units. Each determines his own r.p.m. and fits his engine or his power-driven machine with pulleys of an arbitrary diameter. There is, therefore, no co-ordination between them, and as the manufacturer of the tractor never can tell in advance which particular threshing machine or silo filler will be attached to his machine, and as the manufacturer of a threshing machine or silo filler never knows in advance what tractor the farmer who buys his machine may use, it is impossible under present unstandardized methods of manufacture to fit one to the other as they come from the factories. In fact, almost never is it possible to co-ordinate a power unit with power-driven machines without some change in the pulleys which come with the machines.

To affect co-ordination devolves upon the dealer and for this reason he must know what the rules are which must be employed and how to employ them.

Four factors are involved, three of which always are known. Knowing these three it is very easy to find the fourth to any desired degree of accuracy. These factors are the r.p.m. of the power unit, the diameter of the pulley on the power unit and the diameter of the pulley on the driven

machine and the r.p.m. of the driven machine.

When any three of these are known it is possible, by a simple computation, to ascertain the fourth. To take an example from common practice. A manufacturer of a certain well-known tractor, which has a pulley diameter of 17 in. and an r.p.m. of 800, recommends for use with it a threshing machine which has a pulley of 12 in. and an r.p.m. of 1100.

Suppose, for an example, the farmer owns one of these tractors. He desires to operate the 26-in. threshing machine with his tractor but the pulley for some reason or other has been removed and he knows only that the threshing machine runs at an r.p.m. of 1100. What is the diameter of the pulley which he should use?

The rule in its simplest form may be stated as follows: The diameter of the tractor pulley multiplied by the r.p.m. of the tractor and this product divided by the r.p.m. of the threshing machine will give the approximate diameter of the threshing pulley. Conversely, if the dealer knows the pulley diameter of the threshing machine and its r.p.m. and has a tractor with a known r.p.m. and wants to know what size pulley he will need on the tractor to co-ordinate the two machines, the problem is solved as follows: The diameter of the threshing pulley multiplied by the r.p.m. of the threshing machine and this product divided by the r.p.m. of the tractor will give the approximate diameter of the pulley engine desired.

Taking the figures as given in the above example and studying the problem as one which requires the diameter of the pulley on the threshing machine, the diameter of the pulley on the tractor, 17 in., will be multiplied by the r.p.m. of the tractor, 800, giving a product of 13,600; this divided by 1100, the r.p.m. of the threshing machine, gives 12 and a fraction of an inch.

Or, taking the second problem where the requisite diameter of the tractor pulley is desired, the diameter of the threshing pulley, 12 in., multiplied by the r.p.m. of the threshing machine, 1100, gives a product of 13,200; dividing this by the r.p.m. of the tractor, 800, gives as a result 16½ in.

It will be noted that the results found by these computations are not exactly those used in actual practice, namely, the

diameter of the threshing pulley was found to be a fraction in excess of 12 in., while the diameter of the tractor pulley was found to be 16½ in. instead of 17. In ordinary practice, however, the nearest whole number is taken instead of the fractional number. Therefore, the tractor pulley in this instance would be 17 in. because, where the fraction amounts to half or more, the next higher whole number is taken, and in the case of the threshing machine the fraction over 12 is ignored and 12 in. assumed to be the proper diameter.

For ordinary co-ordinating of tractors on the farm the difference of ½ in. on pulley diameter, except where belt speeds are extraordinarily high, may be neglected, as the resulting difference in the r.p.m. in either the tractor or the driven machine is not great enough to affect the efficiency of either materially.

There are other methods of solving this problem which make for more accurate results, it is true, but they are more involved than the ones suggested and really are not necessary in ordinary practice. If the dealer will keep in his mind the simple relations given both, he will have no difficulty in making co-ordination between tractor and driven machinery which will insure the efficiency of both and will satisfy his customer as well.

CLUB CO-OPERATES WITH DEALERS

Chattanooga, Tenn., July 5—The Chattanooga Automobile Club is entering into the war service plans of the dealers of this city. The dealers, as is now quite well known throughout the trade, are endeavoring to teach owners better acquaintance with their cars, in order that the petty service troubles of the dealer may be eliminated.

To assist in this educational work, the Chattanooga Automobile Club is instituting a school. This school will teach owners how to take care of cars and do all sorts of small roadside repairs, but in addition it will take in men who are in the selective service draft and teach them as much as is possible about the motor car in a brief course. This will make the men better fitted for skilled work when they get into the Army and will make them of more service to the Government.

Suggested Sizes of Power Farm-Operative Equipment for Tractors of Given Rating

The suggestions contained in this table are suggestive only. They are not to be considered as established recommendations. The purpose of the table is rather to illustrate method of determining power equipment which shall be in accord with the power of the tractor than to indicate what shall be recommended in any given case

Tractor Rating	Engine Gang Plow— No. Bottoms	Engine Tandem Disk Harrow— Length in Feet & No. Disks	Threshing Machines— Cylinder Measurement	Silo Fillers— Width of Throat	Huskers & Shredders— No. Rolls	Corn Shellers, Spring— No. Holes	Corn Shellers, Cylindrical— Per Hr.	Power Feed Grinders— Per Hr.	Power Hay Presses, Size Baling Chamber	Tons Per Hr.
5-10	1	5 ft.—20	Small	8	2	2	.....	8-20	14x18	2-3
6-12	1 to 2	5 ft.—20	Small	10	2-4	2	.....	8-20	14x18	2-3
8-16	2	6 ft.—24	18x36	12	4-6	4-6	.....	20-30	16x18	3
9-18	2	6 ft.—24	22x40	14	4-6	4-6	.....	20-30	16x18	3½
10-20	2 to 3	7 ft.—28	24x42	14-16	4-6	4-6	250-400	20-30	17x22	3½
12-24	3	8 ft.—32	28x48	16-18	6-8	6	250-400	30-50	18x22	4½
15-25	3	8 ft.—32	32x54	18-22	6-8	.....	500-800	30-50	22x36	9-10
15-30	3	9 ft.—36	36x40	18-22	8	.....	500-800	30-50	22x36	9-10
20-30	4	9 ft.—36	40x66	22	10	.....	Largest	50-up	Largest	.....
25-45	6	10 ft.—40	40x66	22	10	.....	Largest	50-up	Largest	.....
40-65	8 to 10	12 ft.—48	Largest	26-up	10	.....	Largest	50-up	Largest	.....

Running a Car One Year

What It Cost Two Persons for Operation, Accessories and Kindred Expenses

By Avis Gordon Vestal

WHILE we were still pedestrians, with our motor car yet in the future tense, we used to wonder how much it would cost to stable and shoe and feed and otherwise maintain a gasoline steed. As I recall it we made a pre-purchase guess of \$20 per month. Our first year of ownership has just closed, and I have been having a seance with my cash book.

Our cost, I must admit, was more than we had estimated, but this was balanced by the weight of several aggregated facts. For one thing, we used Jolly Rover more than we had expected. Also, we have received greater, though intangible, interest or profit returns on our investment than we had dared hope. Though it may seem to some of our friends an extravagance for us to possess and operate a "gasoline buggy" we have not charged up the account in the luxury column at all. In our classification these costs are listed under Health Assurance. Both my Senior Partner and I live under a heavy nervous strain for ten months of the year, and the relaxation and refreshment our car has afforded us has been worth whatever it has cost us in cash. When we feel tense we pack up a lunch upon about 10 min. notice, change to our comfortable outing garments, and run away to the woods to cook a hot camp supper. Here we can feast our eyes upon the trees and flowers, enjoy the quiet and unobstructed long-distance vision, and let the wind blow the cobwebs from our brains.

A Practice Period

Our first year has been, in some degree, a practice period. With more experience some of these expenses should be considerably less another twelve-month, unless the prices of gasoline, oil and accessories should sky-rocket this summer. Many of the heaviest costs of this primary year need not be repeated at all during the next five or ten years, so the major portion of their value is an asset to-day ready for usage to be spread over these several annual accountings yet to come.

Our average cost for gasoline was 23 cents a gallon, while our average mileage to date is 15 m.p.g. in all. Our total mileage to date is 6577 miles in the 365 days. This includes 4044 miles spent in a camping tour to Colorado in the summer of 1917, over a variegated assortment of highways, good, bad and indifferent. Gas and some other items cost more in the West than at home. The remaining 2533 miles of the total were run over the paved streets of Chicago or used up in short trips. The very frequent stops and starts in city traffic played their part in shaving down our record of mileage per unit of fuel. My cash book shows a total of 440 gal. at a cost of \$101.42.

Another summary statement is that our car is in practically as good condition as when new. My husband, who is his own chauffeur, has been studying mechanics in

general and the make-up of our car in particular and has made many minor adjustments himself throughout the year. He believes in remedying trouble, in all cases possible, in advance of any real difficulty. Foresight saves many future engine troubles. He inspects the engine from time to time just as a locomotive engineer gives his huge steel steed the once over and views it once more for good measure. I suspect that our home mechanic feels about our car much as a mother does about her baby, that the care it receives during the first year of its life does much to establish its health or weakness for future years. The only points in which our faithful touring car shows wear are in its aesthetic aspects, not in running efficiency. We have several small dents in the fenders, whose function, like that of a fuse in an electric circuit, is to bear the brunt of accidents and be the scapegoat. Through packing our camp outfit too closely the first three days of our western trip our upholstery was cut in several places by the metal corners of our bed. We have recently two broken isinglass panes in the curtains to be renewed and the pockets of the rear doors burst loose from their moorings when we crammed them too full of miscellaneous small camp impedimenta, but these have been tacked in place. Last week a dealer handling our make of car offered to buy it from us for \$800. He did not state how much he would ask his customer. We were not tempted to sell, for the car is worth as much to us as to anyone else.

The year I am recording is from May 12, 1917, to the same date of 1918. The car purchased was a five-passenger touring car, which cost us \$1,040, delivered to Chicago. The retail price at that date was much higher, but we had signed our order in the fall of 1916 and had the advantage of the price at that date, which was \$1,045. The odd \$5 we saved in lieu of interest for the use of our money through an arrangement with a local dealer whereby we paid him throughout the fall, winter and spring in \$100 installments and did not call for the car until the final payment was completed in May, 1917.

Our first expense was for a garage, which my husband erected by his own labor at a cost of \$93.72 for materials, not including paint, which is not yet applied. As we expect this simple shelter to protect our car for at least ten years it is fair to charge not more than \$10 as the share for a single year of use, though the entire sum was paid out at once.

Another of the class of relatively permanent purchases was a portable camp outfit. This item would not appear in the accounts of Mr. Average Car Owner. We consider camping too closely related to the full use of a car to be separated and we

prophesy that coming years will find an increased number of motorists of this opinion. The total cost during the year was \$62.70. As we estimate a minimum life of five years for it our guess, upon this basis, is that not more than \$12 of the cost should be chargeable as one year's proportion of the bill. The individual items are: tent, \$32; bed, \$12; stove, \$3.50; table, \$2.85; two stools, \$1; canvas water bucket, 80 cents; water bag, \$1.25; spade, \$1.10; ax, \$1.25; refrigerator, \$3.95; tent stakes, 40 cents; clamps, 80 cents; rope, 30 cents; bread box, 85 cents, and tableware, 65 cents. Other items were borrowed from their regular uses at home.

Special fees for twelve months aggregated \$30.75, divided as follows: April, 1917, state license, \$4.50; May, 1917, Chicago city license, \$10; December, 1917, state license for 1918, \$6; notary's fee for same, 25 cents; April, 1918, city license for a year, \$10. It is not fair to consider this total as chargeable to the first year alone, for the city license of \$10 is for a period just about to start, while the state license of \$6, dating from January to January, has about two-thirds of its value, or \$4, for the part of the year we have not yet lived. This makes approximately \$14 of the fees paid to be deducted from the total and be considered as an asset toward our second year of ownership.

\$3.75 for Ferries

An account which has nothing tangible left to show for it is that of \$3.75 spent because we could neither ford nor swim two great rivers. During our western vacation tour we crossed both the Missouri and the Mississippi several times. The highest toll was over the narrow, old combination railroad and wagon bridge at Hannibal, Mo., where we paid 50 cents. Farther north we again crossed the majestic Father of Waters. Here the splendid new double-decked bridge between Hamilton, Ill., and Keokuk, Iowa, just below the big power dam, opens its gate at the advance of but a silver quarter. The privilege of riding over the bridges of the Big Muddy came still cheaper, though a steam ferry across its chocolate flood used up a silver cart-wheel. This amount is completely chargeable to the one year. As the mill will never grind with the water that has passed, so the toll gate never opens for the return journey at the remembrance of the coin tendered for the first passage.

Another group of costs fully consumed and leaving no left-overs to be warmed up for the coming year's consumption is that of garage rentals. We spent \$5 sheltering our car when visiting hosts who had no shelter or who had no yard we could use, or a yard with no wide gateway. Prices for the same service varied greatly. In Dodge City, on the Santa Fe trail in western Kansas, we were asked but 25 cents a 24 hr., or about a cent an hour. At State Center, Iowa, on the Lincoln

highway, a much smaller town, we paid 50 cents a day. In Chicago we have paid 25 to 50 cents per hour.

Our purchase of accessories is a mixed account. A small portion was for items now relegated to the scrap heap, but nearly all of the \$66.60 total is represented today by tools or comforts which will serve us during the second and many successive seasons. No two motorists would make the same selection of efficient labor-savers and conveniences. The personal equation enters largely here. The small tools supplied with the car were not fully adequate in their number and variety, especially in the assortment of wrenches, while the jack and pump proved of poor quality. Where an accessory was purchased to replace one damaged or lost it will usually appear in another department. The items are: tire pressure gage, \$1; lock, \$6.50; battery hydrometer, 80 cents; two cowl lamps, 40 cents; two pairs of goggles, \$2; five wrenches, \$4.40; washers, 45 cents; grease gun, \$2; one pair rear tire chains, \$7; one pair front tire chains, \$3.20; fine file, 15 cents; radiator cover, \$3.50; lamp box, 90 cents; extra lamps, \$1.25; funnel, 50 cents; two tow ropes, \$2.20; heel rest, 25 cents; one pair non-glare headlight lenses, \$3; cover for spare tire \$1.75; three flag holders, 50 cents; three small silk flags, 60 cents; map, 25 cents; Bluebook, year old, \$1.50; one pair Hartford shock absorbers, \$22.50.

Lock for Car

We had planned to take out theft insurance, but our city has an unsavory reputation for light fingered gentry who do not recognize the distinction between thine and mine, so the insurance rate is very high. Further, this service is tied up arbitrarily with the purchase of other forms of insurance of which we do not feel the need. Hence our purchase of a lock which cannot be tampered with easily in the sight of other people. We rarely leave the car standing in the business section or in an unlighted street at night.

Our pair of shock absorbers is partly a luxury for our comfort, but my partner considers them justified also because they protect the car from injury upon the occasional very bumpy places we have encountered. We hope to place a set upon the front springs, also, at some future time.

Total operating expenses for the year, according to my classification, were \$121.96, covering gas, oil, grease, distilled water and kerosene. Of this \$101.42 was for 440 gal. of gasoline. Prices for this fuel varied at different seasons of the year at home and at different filling stations even at the same time, being usually 21 to 23 cents. In western Illinois, Missouri and the eastern half of Kansas we paid usually 19 to 20 cents. From western Kansas onward the price rose regularly and rapidly as we rode toward the western sun. It was 20 cents in Dodge City and 24 cents at Syracuse, both in the Sunflower State. In Colorado we paid 28 cents at Avondale, 26 cents in Pueblo and Denver, 27 cents at Loveland, 31 and 32 cents in Estes Park and 28 cents at Fort Collins. On the homeward trip through Nebraska we paid 27 cents at Big Springs and 25 cents at Lexington and Grand Island. Iowa

took 20 to 21 cents. About \$17.50 of the balance of this operating cost was for oiling the various working parts, each with its own grade of heavy or light lubricant.

What I have dubbed repairs and renewals, though you might classify some of these items under other headings, is our largest single account, principally because it includes a new quartette of tires which have run but 677 miles of the total 6577 miles ran during the year. At least \$200 of their cost, possibly even more, should be carried over into the second year, as this service is but a tiny fraction of the wear they should deliver to us. The original four tires which were on the car when purchased ran 5900 miles, when the two rears blew out on one short trip. Our vulcanizer said they were not worth repairing. The two original front tires, now thin and weak, we shall probably use only in emergencies, as second-class spares. The second-hand tire which we purchased and had vulcanized and supplied with a new inner tube served us well as a spare and has had so little wear that we consider it still largely as an asset for next year. Accidents, breakage and lost articles appear in this list. Punctures were mostly from tacks picked up in or very near towns and, apparently the same, the charges for vulcanizing them ranged from 25 cents to \$1. Our heaviest tire repair was \$6 spent in Denver. We had had a nail puncture in eastern Colorado and the garage man had mended the tube and refused to mend the tiny hole in the casing, assuring us it was needless. Coming down our first mountain road, in the Genessee neighborhood, a loose stone caught in this little hole and ripped it into a large tear, when we had our first real blowout; in fact, the only one until the two rears wound up their service in two explosions this spring.

Details include: Second-hand casing to serve as spare, \$8; vulcanizing its thin spots, \$1; new inner tube for same, \$5; March, 1918, two cord tires, \$101; March, 1918, two ribbed cord tires, \$98; same date, four inner tubes, \$25; tire patch, 75 cents; tire boot, \$1; vulcanizing sixteen punctures and one blowout, \$14.25; repairs to

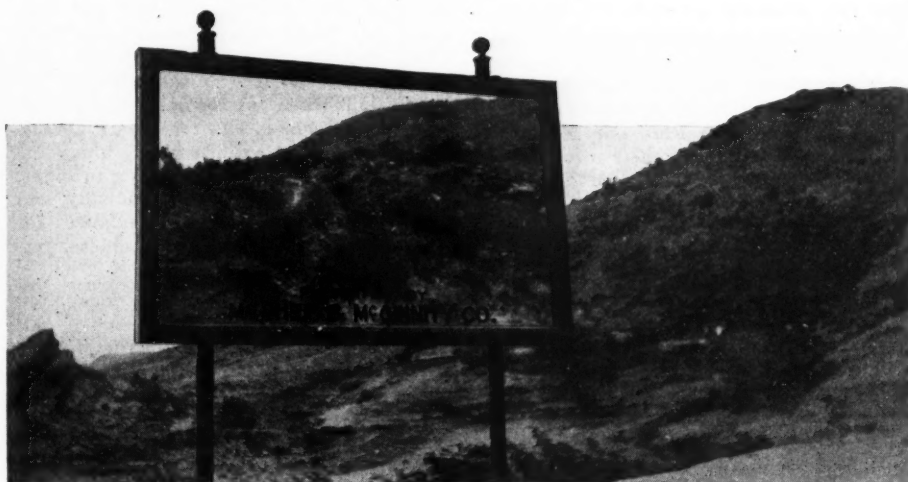
fender of a Ford we side-swiped, \$3; repairs to our damaged upholstery, \$2; burning out carbon, \$3; adjusting pushrod, 25 cents; adjusting carbureter, twice, \$1.75; repairing broken horn bracket, \$1.25; oiling and cleaning car at garage, \$2; repairs to electric system, \$1; cleaning, inspecting and overhauling car at end of long trip, \$37; ten valve centers, 50 cents; 3 oz. sweet oil for leather, 10 cents; ignition key, 25 cents; rubber cement, 10 cents; two bottles polish, 50 cents; tire pump, \$2.50; insulating tape, 30 cents; screws, 5 cents; tire cement, 50 cents; cap for gas tank, 50 cents; non-glare headlight lens, \$1.80; cotton waste, 20 cents; jack, \$1.50; another jack to replace broken one, \$2; polish and carbon remover, \$2; horn washers, 25 cents; valve grinding paste, 30 cents; total, \$318.60.

Gathering the loose threads together shows the money actually spent in the year:

Garage, unpainted	\$ 93.72
Camp outfit	62.70
Special fees, city and state.....	30.75
Bridge tolls and ferry.....	3.75
Garage storage of car.....	5.00
Accessories	66.60
Operating expenses (gas, oil, etc.)..	121.96
Repairs and renewals.....	318.60
Total	\$703.08

In the following I list the complete sum of all expenses having no assets left over. Other accounts are divided by a figure representing what we consider the minimum number of years this first outlay should serve us.

Tenth cost of garage.....	\$ 9.37
Fifth cost of camp equipment.....	12.54
Special fees, deducting \$14 estimated service yet to run.....	16.75
Bridge tolls	3.75
Garage storage	5.00
Accessories, estimated at fifth of..	13.32
Operating expenses	121.96
Repairs and renewals, deducting \$200 for wear left in tires.....	118.60
Total	\$301.29
Average per month.....	\$ 25.11

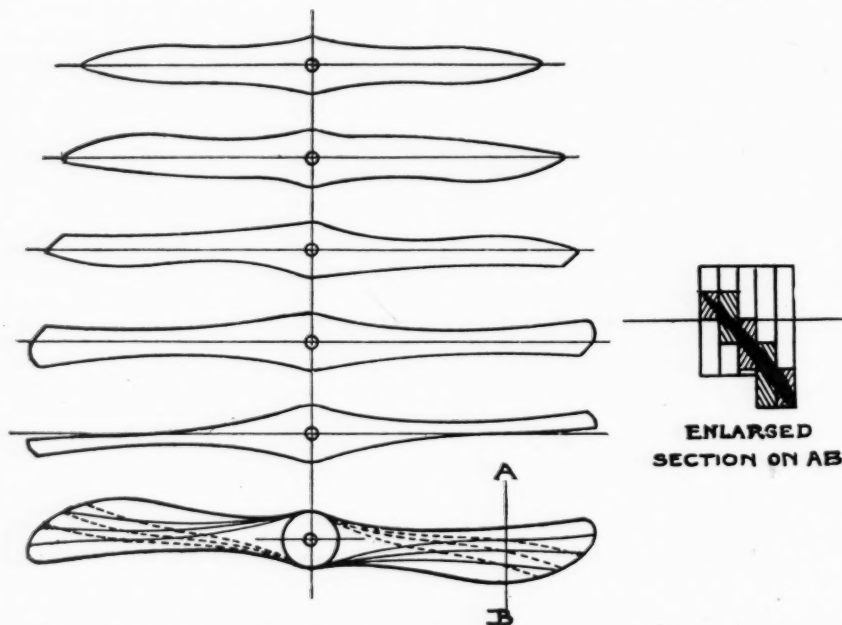


THE idea above is one which any community could adopt with benefit not only to touring motorists, who find themselves among strange curves and turns of the roads, but to its own car owners and drivers. A mirror has been erected at a bend in the road, showing to the driver coming down one side of the "elbow" the condition of the road and the absence or presence of oncoming cars on the other side. Such mirrors could be erected by the town, motor club, private business concern or others with the welfare of the public at heart

Making Propellers for Airplanes

Important Work of Constructing Part for Flying Machine and What It Involves

By Allen Sinsheimer



Shape of laminations and method of assembling for propeller made of five laminations

WASHINGTON, July 5—Twenty-five experienced American manufacturers now are producing between 350 and 400 airplanes propellers, fitted for the most strenuous air service, per day. Ample stock of propeller timber already is purchased or available, and the present supply of propellers in this country is more than equal to the demand.

The number of spare propellers required for each fighting unit was reduced by the air service recently. Hence, it has been possible to cut down the original program for the production of propellers.

Four 1917 Concerns

After the declaration of war the Signal Corps was forced to build up the existing propeller industry and encourage the manufacture of propellers as a new enterprise. In April, 1917, there were only four airplane companies making their own propellers. Each of these produced propellers in keeping with the requirements of their airplane output. In addition, six other companies made spare propellers for airplane companies not manufacturing them and for foreign governments, the United States Army and Navy, private aviation schools and exhibition and amateur flyers. The total output last April was approximately twenty-five propellers per day.

Since that time a great development has taken place, especially since December, 1917. The older companies have expanded and new concerns have sprung up, due chiefly to the increased demand for propellers and the requests of the Signal Corps. The Government co-operated both in design and production, resulting in the adoption of standard methods and econom-

ical manufacture. The treatment of airplane propeller lumber was worked out, and many special machines and tools were developed and built, materially reducing the amount of hand work previously necessary.

American double-bladed airplane propellers are built up from boards about an inch thick, cut out to the rough shape of the laminations, somewhat as shown in the sketch.

These boards, or laminations, are cut out from carefully selected lumber which previously has been kiln-dried to a uniform moisture content of from 6 to 8 per cent, great care being taken to avoid case hardening and too rapid drying, which may diminish the strength of the lumber. The laminations when cut for use in the propeller must be clear pieces, free of all defects and with straight grain running along the length of the piece. After cutting to shape, the boards are balanced individually and selected according to this balance for grouping together for the complete propeller.

Following this selection, the completed groups of laminations are assembled and placed in a hot box to prepare for glueing. With correct temperatures of material and room, glueing is done as rapidly as possible and the glued-up blocks left in presses or clamps to set for 24 hr. The blocks then are cut down by carving machines, lathes, shapers, etc., to within about $\frac{1}{4}$ in. of the final finished size and shape and in this state are hung for two weeks in a conditioning room before being worked to the final finish.

The final finish is done on the bench and

completes the propeller to the point of being ready for varnish or covering. The bench work is done with great accuracy so as to conform exactly to the desired pitch and shape and to have the two blades in exact alignment and track. The propeller, acting as a flywheel for the airplane engine, must be perfectly balanced. When the propeller is finished "in the white," it is ready for inspection of glue joints, dimensions and balance, after which it is finished with five coats of spar varnish and rebalanced.

Some propellers have the tips covered with copper or linen fabric to protect them against splitting, which results from picking up sand, running in long grass or in the rain.

Existing opinion is divided somewhat as to the best wood for propeller purposes, but the past practice of French and English governments greatly favors walnut and mahogany for combat blades, the former being considered best. Other woods have been used extensively for training-type propellers, principally quarter-sawn white oak, birch, cherry and poplar. Originally the walnut used by the French was their own French walnut but this wood is no longer available. American black walnut has taken its place and large quantities have been exported to England and France for propeller purposes as well as for the manufacture of rifle stocks. To-day the available supply of black walnut is limited by the ability of producers to obtain the scattered timber and the demand is greatly in excess of the supply. The exclusive use of black walnut for rifle stocks manufactured in the United States has an important bearing upon the available supply for propellers.

Imported and Exported

All the mahogany used for the last four years has been exported as lumber from the United States, having been imported in the log from Central America and Mexico. Some of the largest and best tracts of mahogany timber are in British Honduras. This is being cut under the direction of the British Admiralty and brought into the United States for manufacturing into propeller lumber before exporting to England. Large quantities of British Honduras mahogany and other tropical mahogany have been exported, so that the existing situation is one wherein the available supply is just about adequate for the combined demands of the Allies and the United States, provided restrictions are placed upon the use of mahogany propeller stocks for commercial purposes. This situation which affects the manufacture of furniture, pianos and the like, can be relieved by the use of substitutes such as Philippine mahogany, which is lacking in some qualities required by the specifications for propeller wood.

It is believed that quarter-sawn white oak will come to be used more generally on account of its greater strength and the necessity for getting maximum strength in the propellers used on the newer high-powered, high-speed engines.

The amount of wood in the present two-bladed propellers varies from 30 board feet in a training type to 80 ft. in a combat type. These figures are net, while the gross lumber required to manufacture will be about twice the net amount in both instances.

Metal Propellers

Many attempts have been made to design and produce a metal propeller, but to date no tests reported have been sufficiently successful to put into production. The difficulty is to construct the blade light enough and strong enough to resist the tensile and bending strains set up. Propellers have been manufactured from a material called Bakelite, a canvas and acid glue, shaped under hydraulic pressure at a high heat. To date these have been successful in test and flight. They weigh slightly more than wooden propellers of the same design but have greater resistance to wear and tear.

The general theory in determining the number of blades is based upon the double requirement of developing the maximum efficiency of the engine horsepower, eliminating resistance losses and at the same time developing a blade that will be adaptable to the construction of the complete machine.

The greatest efficiency always is obtained by a two-bladed propeller of the largest diameter that the engine will turn at the correct engine speed. In this way the propeller has an effective thrust over the maximum possible air area with least blade surface resistance.

In many cases, however, the construction of the plane is such that a two-bladed propeller of sufficient diameter cannot be used on account of clearance, and the three or four-bladed propeller is adapted to take up the full horsepower in effective thrust, in spite of greater resistance losses. The four-bladed propeller generally is used instead of the three, because of its simpler and stronger construction features. The two-bladed propeller is more efficient than the three or four and would always be used if the arrangement of plane and engine permitted.

The automotive dealer, on the contrary, long had been habituated to the necessity of service in his motor car trade and was equipped to render it. Furthermore, he was habituated to the cash plan of doing business, was accustomed to paying in advance for his stock of motor cars and selling for cash in turn. He met the necessities of the tractor business without difficulty. They were nothing new to him. He had no established credit customs to change nor had he to overcome a natural inclination to do business on a credit basis. Furthermore, he had a better idea of the value of a demonstration and invariably proved himself an acceptable representative, largely because he was resourceful and could take care of the demands of service without recourse to the manufacturer. This reduced the expense of tractor selling and made it possible for both the manufacturer and the dealer to make a profit on a business which oftentimes had been unprofitable to both manufacturer and dealer under the old system.

Another thing which assisted the automotive dealer in securing control of the tractor trade was the attitude of the farmer himself. In buying from the retail implement dealer, the farmer had had credit always in the past and expected to secure credit in the present and future. He could not understand, or would not, that a difference should be made between horse-drawn farm equipment and power equipment, the one being bought on credit and the other on cash. The farmer had, however, bought motor cars and he knew that he had to pay cash for them. Therefore, when he bought a tractor from an automotive dealer, he readily responded to the cash plan of doing business. This may be curiously inconsistent, but nevertheless it was a factor of importance in making the automotive dealer a success in the tractor trade.

Ignorance of Tractor

The principal difficulty experienced by the automotive dealer in engaging in the tractor trade was his comparative ignorance regarding the equipment which is sold with the tractor. In the beginning this was a decided disadvantage, but with the development of the tractor there came a parallel development of power-farming equipment, particularly in the plow line, which made plow adjustment so nearly automatic that the same expert attention was not demanded that was required in the beginning of power-farming development. Furthermore, there has, within the last year or two, been manifest a tendency toward unit construction. By this is meant, for instance, certain plows have been designed particularly for use with certain tractors, so that it is becoming quite the custom in the trade for the tractor and the plow to be sold as a unit. Thus, it is much easier for a dealer who has had no previous experience with farm-operative equipment, as is quite the case with the automotive dealer, to overcome this handicap.

Numerically it is probable that more dealers handling tractors, at the present time, are of the implement variety than of the automotive variety, but the tendency is steadily in the direction of the motor car dealer and there is small doubt that within a reasonably short time he will be the controlling factor in the trade.

Automotive Dealer as Tractor Agent Tendency Toward Controlling Factor in Trade

A SIGNIFICANT fact in the tractor trade is the growing popularity of automotive dealers with the tractor manufacturers. One needs to spend but very little time talking with the makers of tractors before being impressed with this fact. That the admission of the importance the automotive dealer is taking in the distribution of tractors comes at times reluctantly does not alter the fact in the slightest. The truth of the matter is that in many sections the dealer who is making the greatest success in the tractor trade and who is proving to be the most satisfactory representative for the tractor manufacturer is the man who has had experience in the motor car trade.

Won Against Prejudice

This is the more significant because this popularity has been won against preference and sometimes against actual prejudice. The reason is not far to seek. Until very recently those manufacturers who had the largest production and who, therefore, were the controlling factors in the tractor trade were primarily manufacturers of farm operative equipment. They had been for years manufacturing either tillage implements or harvester equipment. When the development of agriculture necessitated the tractor, naturally these were the concerns best equipped by experience and knowledge of agricultural needs to produce the new power unit. Just as naturally when this was produced, it was classified as a farm implement. It is very easy to see, therefore, why, when it came to the matter of distribution, these manufacturers who for years had distributed their product through those known as implement dealers should look to the personnel of that same trade for the distribution of tractors. Habit, inclination and preference all pointed in this direction. There-

fore, when the new factor in the distributive field presented its claims for recognition, the old time tractor manufacturers looked askance at it and more or less reluctantly admitted it to his confidence.

However, the automotive dealer found it easier to break into tractor merchandising because the old time retail implement dealer had failed in a measure to rise to the opportunity. In the implement trade credit was an established institution. Doing business for cash was a revolutionary innovation. The implement dealer was not accustomed to it and he found it difficult to readjust his business customs to meet the cash conditions which the tractor manufacturer found it necessary to impose.

The implement dealer also was indisposed to take any chances. He was not willing to stock tractors and invest his money in them with nothing but the hope or expectation of disposing of them. He preferred to get his order before he received his shipment. Necessarily this operated as a delay upon the introduction of tractors and in a way threw the burden of the introduction on to the manufacturer. The latter found it necessary in many instances to send tractor salesmen into the territory and procure the orders for the dealer, who really himself did nothing to further the deal.

In addition, very few of the dealers were equipped to give the kind and quality of service the tractor demanded during the period of its introduction, demanded because the farmer was unacquainted with tractor operation and had not the necessary knowledge and experience to keep his tractor working to the height of its efficiency. The dealer further was unsatisfactory inasmuch as he looked to the manufacturer in all cases of trouble for expert attention and service.

Springfield Distributer Puts the Fordson Through Its Paces



The Jennings Auto Sales Co. of Springfield, Ill., was allotted 125 Fordson tractors to sell from the state's quota



The company staged a two-day demonstration and sold its entire quota of 125 by afternoon of the second day



Yes, a man drove the tractor in this photograph, but see how much larger an audience his neighbor has drawn

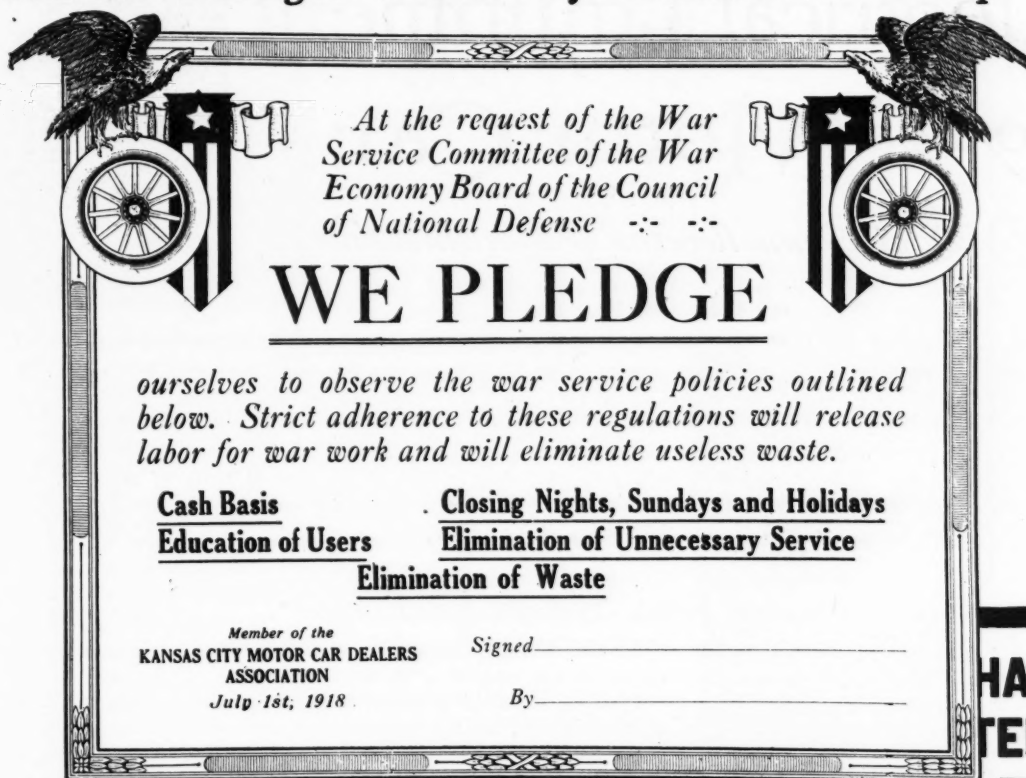


Many of the dealers who stage these one- or two-day demonstrations are using women to drive the tractors



Two views of the crowd that attended the demonstration

Service Pledges Made by Dealers to Help Win the War



At the request of the War Service Committee of the War Economy Board of the Council of National Defense -- --

WE PLEDGE

ourselves to observe the war service policies outlined below. Strict adherence to these regulations will release labor for war work and will eliminate useless waste.

<u>Cash Basis</u>	<u>Closing Nights, Sundays and Holidays</u>
<u>Education of Users</u>	<u>Elimination of Unnecessary Service</u>
<u>Elimination of Waste</u>	

Member of the
KANSAS CITY MOTOR CAR DEALERS
ASSOCIATION
July 1st, 1918

Signed _____
By _____

"WE have enlisted to help win this war," says the Chicago Automobile Trade Association in its poster which was sent to each establishment and which contains three items that embody the order in condensed form. Truck service stations are being kept open in Chicago, so that all transportation equipment, such as the motor truck is, can be kept moving. The poster is printed in red and black and is for prominent display so that the public can be advised of the pledge quickly

FIVE special garages in Kansas City have been designated by the committee of the garagemen's association, though their appointment is tentative until practice indicates whether the number is adequate or not. Every establishment has a poster on the front door announcing the closing agreement and giving the telephone number for the emergency service; 10,000 cards with the telephone number also have been distributed among car owners. The number is that of the Motor Car Dealers' Association, which has a man at night and on holidays to receive emergency calls. He is a mechanic and gives suggestions to motorists in trouble and transmits orders for tows

BE PREPARED FOR

Emergency Service!

NIGHTS, SUNDAYS and
HOLIDAYS

BECAUSE

This Entire Establishment will be closed after 6 p. m. and on Sundays and Holidays

By Direction of the

War Service Committee

For Emergency Service Telephone Main 6624

NOTE—Emergency Service does not under any circumstances include the sale, repair or changing of tires or tubes.

HAVE TED TO HELP WIN THIS WAR

THE GOVERNMENT NEEDS EXPERT MECHANICS
WILL YOU HELP RELEASE THEM?
SELF-SACRIFICE IS THE RULE.

NOTICE!

Complying with the request of the War Economy Board of the Council of National Defense, and in accordance with the resolution adopted by the Board of Directors of the National Automobile Dealers Association at St. Louis May 18, 1918, the following war time policy will be enforced by this establishment for the purpose of releasing expert mechanics for Government work.

EFFECTIVE JUNE 1, 1918

1. We will discontinue all unnecessary and free service and inspections.
2. Our salesroom, repair shop and all other departments will be closed after 6:00 P. M. daily, and all day Sundays and holidays.
3. In order to eliminate unnecessary office work, the Government has requested that all business be conducted as economically and efficiently as possible. Therefore, on and after JUNE 1st, 1918, charge accounts will be discontinued. All parts, repairs and labor will be C. O. D.

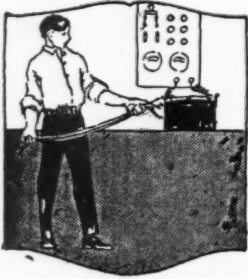
YOUR PATRIOTIC DUTY

It will be the patriotic duty of every owner to make all minor adjustments and repairs himself to the end that every expert mechanic available for war work may be released to the Government.

Owners are urged to see that their tools are in order, that jack and pump are in working condition, that extra tubes and tires are in proper repair and that other necessary equipment is in condition to enable them to take care of emergency repairs on the road.

Conserve gasoline, oil and grease whenever possible.

NATIONAL AUTOMOBILE DEALERS ASS'N.



Electrical Equipment of the Motor Car

By David Penn-Moreton & Darwin S. Hatch.



Editor's Note—Herewith is presented the 102d installment of a weekly series of articles begun in MOTOR AGE, issue of June 29, 1916, designed to give the motorist the knowledge necessary to enable him to care for and repair any and all of the electrical features of his car, no matter what make or model it may be. At the conclusion of this series, "Electrical Equipment of the Motor Car," with additions, will be published in book form by the U. P. C. Book Co., Inc., New York.

A thorough explanation of the fundamentals of electric circuits preceded descriptions of the general types of starting, lighting and ignition apparatus, signalling devices, magnetic transmissions, etc. This is being followed by the installation, care and repair of individual systems, beginning with the special equipment for Fords.

Part CII—Atwater Kent System for Fords

BEFORE starting the installation of the type K-2 Atwater Kent ignition system for Fords the following list of material should be checked carefully to see that everything required is on hand. The different essential parts are shown in Fig. 563.

Material Included in Outfit

- 1—Four cylinder K-2 Unisparker mounted on special gearcase cover to fit in place of standard Ford gearcase cover, shown at A in the figure.
- 2—A spiral drive gear, B.
- 3—One Atwater Kent ignition coil with switch complete, C.
- 4—Flexible double-conductor cable for connecting the Unisparker and coil. This cable is attached to the Unisparker when shipped and is shown at D in the figure.
- 5—Two cotter pins for pulley, E.
- 6—Four wood screws, F, for attaching the coil to the dash.
- 7—A special socket wrench, G.

Additional Material Required

In addition to the material supplied the following should be provided:

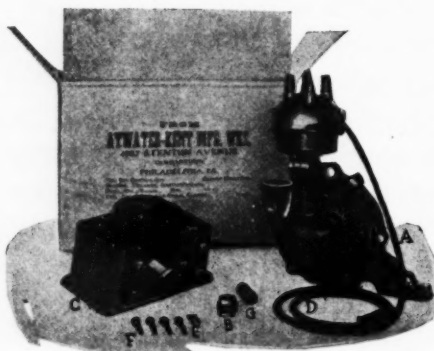


Fig. 563—Essential parts of the K-2 Atwater Kent ignition system



Fig. 564—Cut off lug on the fan bracket as indicated

Eleven feet of high-grade secondary wire having an outside diameter not exceeding $\frac{1}{8}$ in.

Flexible stranded primary wire—if car is a roadster, 15 ft.; if touring car, 25 ft.

Six cells of dry battery or a 6-volt storage battery.

Tools Required

The only tools required for completing the installation are screwdriver, pair of pliers, monkey wrench, hacksaw and pocket knife.

Making the Installation

- 1—Remove Ford coil box and all ignition wiring.
- 2—Remove radiator as follows:
 - a—Drain off circulating water.
 - b—Remove the right headlamp when facing the radiator.
 - c—Unbolt upper water connection and loosen hose connection on side of engine, so as to leave both sections of hose connected to the radiator. It is easier to unbolt the water connection flange than to remove and replace the upper hose connection.
 - d—Loosen brace-rod check nut at dash and unscrew rod from radiator.
 - e—Remove nuts from feet of radiator and radiator may be lifted off.
- 3—Remove fan and fan bracket and cut off lug as shown in sketch, Fig. 564.
- 4—Remove adjusting screw and locknut from present gearcover and place same in the new gearcover furnished with outfit, Fig. 565.
- 5—Remove commutator by taking off nut, washer and pin, sliding off contact arm and commutator.
- 6—Remove cotter pins from pin in fan pulley on crankshaft, Fig. 566, and drive out pin which runs clear through the shaft. This pulley must be moved forward on the crankshaft about $\frac{1}{2}$ in. to set the new gearcover in place, after which it is moved back to its original position, new cotter pins being provided in case the original ones are damaged in removing.
- 7—Remove gearcover, using the special socket wrench provided with the outfit for taking out the bolts which are next to the crankshaft.
- 8—Remove semi-circular piece of felt from groove in Ford gearcover where it fits over the crankshaft and replace in new gearcover furnished with outfit.
- 9—Place spiral gear of Atwater Kent system on camshaft in

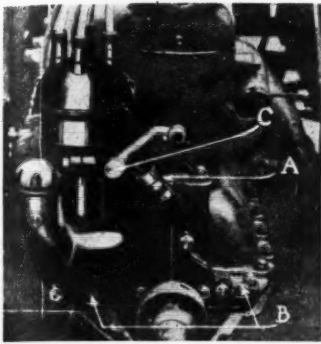


Fig. 565—Atwater Kent type K-2 Unispark in position on a Ford

the place formerly occupied by the commutator and set up tight, applying plenty of grease to teeth of spiral gear.

- 10—Be sure that the paper gasket used between the old gearcover and crankcase is in good condition and is transferred carefully to the new installation.
- 11—Place the new gearcover complete with Unispark in position on the motor, sliding it into place, as shown in Fig. 567. After it is in position insert the two end bolts, marked B, Fig. 565, also screw in the fan bracket bolt C, thus obtaining the proper alignment of the gearcover, after which the other bolts may be set up.
- 12—Next, the fan pulley on the crankshaft should be set back into position, inserting the pin and fastening this in turn with the two cotter pins included with the outfit.
- 13—Remove spark plug in cylinder No. 1 next to radiator.
- 14—Bring piston in No. 1 cylinder up exactly to high dead center at top of compression stroke.

Timing the Engine

- 1—Set clamp under Unispark so that Unispark may be turned in its bearing. For accurate setting it should be clamped just tight enough to turn fairly hard. Then, grasping the Unispark firmly, turn it slowly and steadily in the opposite direction to the hands of a clock until a click is heard. Stopping exactly at the point where the click was heard, lock the Unispark fast by tightening up clamp bolt. In case the Unispark is turned so that the cable which projects from the side interferes with the fan, turn the Unispark a full quarter turn until the next click is heard.
- 2—Take off distributor cap.
- 3—Note the direction in which the distributor block on the upper part of the distributor points and replace the cover. The terminal to which it points will connect to the spark plug in cylinder No. 1 and the spark will be timed to occur exactly on center. The diagram in Fig. 568 shows the relation of the distributor terminals to the spark plugs and in applying this to your installation the distributor terminal to which the distributor block points always will be No. 1 and will connect to cylinder No. 1. The other terminals will connect to the remainder of the spark plugs in accordance with the order of firing of the Ford engine, which is 1-2-4-3, the other distributor terminals connecting to these plugs in rotation.

If spark timing is done accurately according to these instructions, the timing will be correct for the maximum power, speed and flexibility of the engine.

Once set, the spark is controlled automatically by the governing device in the base of the Unispark, and the spark is timed with automatic precision for any speed. It always is retarded automatically for slow starting and for hill climbing and automatically advanced for any speed of which the engine is capable. Once properly timed, it should require no further attention.

Before proceeding with the wiring, complete the mechanical installation as follows:

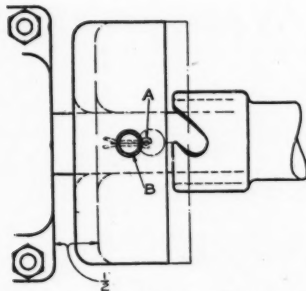


Fig. 566—Removing pin that holds the pulley on the crankshaft

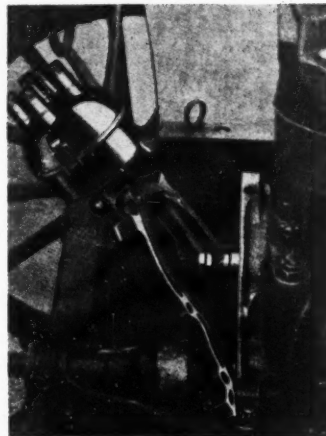


Fig. 567—Placing new gear cover and Unispark in position

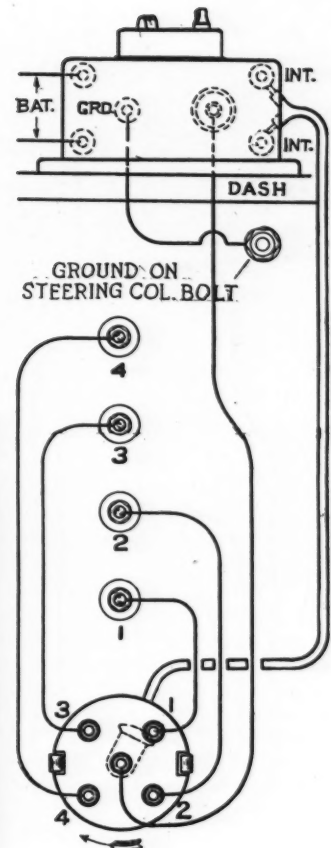


Fig. 568—Diagram of connections for Atwater Kent ignition system

- 1—Replace breather cap taken from old gearcover.
- 2—Replace fan and bracket on new gearcover, making sure that grease cup on fan is full of grease.
- 3—Replace radiator as follows:
 - a—Set radiator in position.
 - b—Connect upper and lower water coupling. Note that gasket is in good condition.
 - c—Bolt radiator in place, taking care not to set up springs under the bolts too tightly.
 - d—Replace cotter pins in lock nuts.
 - e—Connect brace rod from dash to radiator, screwing it first into radiator and then tightening up lock nut at dash.
- 4—Replace lamp.
- 5—Replace spark plug in No. 1 cylinder.
- 6—Mount Atwater Kent coil on center of dash so that round head of brace rod fits in space counter-bored for it on back of coil. The necessary screws for mounting the coil on dash are provided with the outfit.

After mounting coil, proceed with wiring as follows:

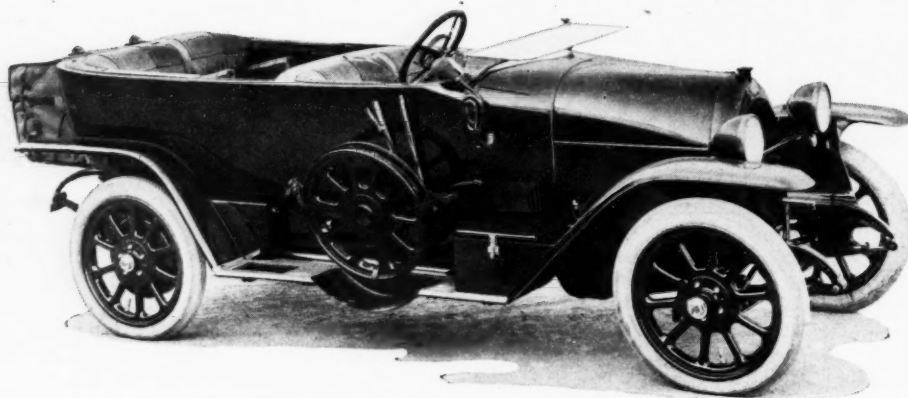
Run the black primary cable, which is connected to the interrupter, up along the brace rod, fastening it thereto with a few turns of adhesive tape, and thence, through one of the holes left by the original coil wires, to the coil where the two wires are connected to the two binding posts at one end of the coil marked "INT," Fig. 568.

Secondary Ground Connection

From the bottom of the coil a wire should be run from the post marked "GRD" through hole in dash to one of the bolts fastening the steering column to dash. In making this connection to this bolt, the wire should be bared for about 1½ in., bent into a U-shape and inserted between dash and washer. Do not wrap wire around bolt several times.

The main high-tension, or secondary, terminal of the coil is protected with an insulating cover which unscrews to enable connection to be made at binding post.

How Does the War Affect European Cars?



European tendencies in car and body styles well might be deduced from this model, which recently was delivered by Fiat to the Italian Ministers of Arms and Munitions

AS an example of European tendencies in car and body styles, the car recently delivered by Fiat to Signor Dalloio, Italian Minister of Arms and Munitions, is of general interest. Mechanically there are no great changes in the chassis, which has a four-cylinder engine of 100 by 180 mm., 3.9 by 7.08 in. bore and stroke, a four-speed gearset and spiral bevel rear axle. An electric lighting set is fitted, with belt-driven dynamo, but there is no electric starter. The storage batteries are carried on the right running board, the box being shaped to fit the front fender. This is becoming a favorite European position, for it makes the batteries completely accessible and reduces length of wiring. Fiat seem to have adopted this position for all their post-war cars. On the left hand running board is a corresponding metal box, with trays, for carrying tools.

A straight line effect is sought in the body. The cowl has very little slope, while the top rail of the body is practically straight. The fenders are domed slightly, but do not follow the contour of the wheels; they are kept straight to enhance the straight-line effect of the car. The top is one-man type, completely disappearing into a cabinet back of the rear seats. The two rear seats are divided. There is a deck back of the front seats and under this a cabinet containing three folding tables with drawers for thermos bottle, maps, etc. Storm curtains make it possible to transform the car into a completely closed vehicle, there being a close fit between the top and the windscreen and the forward side curtains being brought around the edges of the windscreen. Head and side lights are combined. Inside are electric lights for the driver's compartment, for the tables in the rear compartment, and also a roof light. A large capacity baggage rack is mounted at the rear. The wheels are detachable steel-spoke variety equipped with 34 by 4½ in. clincher tires.

New Air Gun

THE Browning machine gun has undergone successfully a test to determine its value for use with aircraft. With the Marlin aircraft gun, it will be employed

for this purpose in its heavy type with the waterjacket removed.

The test of the Browning gun was very severe. A gun was mounted on the frame of an American combat plane and connected with the airplane engine. The test



The man who asked for more service would find it here in its fullest sense—everything but the vocal directions

Service That Is Service

SOMEONE has said that he who devises another new use to which the motor car may be put is the man who is doing a real service in this world, whether that use be in connection with the farm, the suburban place or the city establishment. That is why the motorist who devised the novel job for the motor shown in the accompanying illustration is a real friend of mankind. This truck is being made to do the work of a hay and grain elevator, a feat that any motor vehicle may be made to perform.

This truck delivered a load of hay to this storeroom, and as there was no way of conveying it to the second floor it was decided to put the truck to work. To do this the machine was backed a short dis-

was conducted on the ground and in place of the propeller a metal disk was attached to the crankshaft. The Browning gun then was required to register hits on the metal disk as it revolved at varying speeds from 400 to 2000 r.p.m. The slightest hang-fire or delay in action on the part of the gun would have been shown by the failure of the bullets to hit precisely on the spot on the disk representing the center of the zone of fire. The gun functioned perfectly.

This gun is one of the three types of machine guns with which the rate of fire can be so synchronized with the revolutions of the propeller of a tractor airplane that the gun can be fired by the pilot of a combat plane through the revolving blades.

Airplane propellers revolve at the rate of from 800 to 2000 r.p.m. The machine gun is connected with the airplane engine by a mechanical or hydraulic device, and impulses from the crankshaft are transmitted to the machine gun. The rate of fire is constant and is synchronized with the revolving propeller blades by wasting a certain percentage of the impulses it receives from the airplane engine and by having the remaining impulses trip, or pull, the trigger so that the gun fires just at the fraction of the second when the propeller blades are clear of the line of fire. The pilot operates the gun by a lever, which

tance from the building, after which the brake was applied and one of the rear wheels was jacked up. The lifting rope was run around three bales of hay and passed through a block and tackle, the opposite end of the rope being wrapped twice around the hub that was elevated. An employee was stationed where he could take up the slack of the rope.

The engine of the truck was started, this resulting in the turning of the raised rear wheel and hub. As the hub turned the rope was drawn in and the bales of hay were raised to the height of the second floor onto which they were drawn by a workman. Any other commodity could have been raised just as readily by this new method of elevation.

controls the circuit and allows the impulses to trip the trigger.

The British and French use the Vickers as a synchronized machine gun. The Lewis aircraft machine gun is used by American, British and French, though for a different purpose. In two-seated combat planes, fixed machine guns are mounted forward to be operated by the pilot, and flexible guns are mounted to be operated by the observers in the rear seats of the planes. The observers operate Lewis guns on flexible mounts, firing to right or left of the plane.

Synchronized machine guns on tractor airplanes must be absolutely reliable in functioning. Delays in fire or malfunctions due to faulty construction or imperfect ammunition causes bullets to strike the propeller blades. As many as fifteen bullets have been known to strike a propeller blade without causing an airplane to fall, but the danger is obvious nevertheless. Only specially selected ammunition is used for that reason, and every effort is made to provide the most perfect type of weapon for this work.



If you want some honey grown from your back yard clover patch all you have to do is send for L. E. Mercer and his motorized bees, and let them do the rest

Suppose Orphan Annie Had Had This Man's Job?

IF "little orphan Annie" had had this man's job, she couldn't have "come to our house to stay." Here is why.

L. E. Mercer, of Castaic, Cal., claims that by the aid of the motor truck it is possible for him to almost treble his honey output per year from a given number of bees. This result is secured by transporting the bees from place to place at various times of the year so that the bees may take advantage of the blossoming seasons in the

different sections. It is generally known that the bee works within a radius of 2 or 3 miles from the hives and let it go at that and that for this reason they either do a lot of unnecessary work in going over flowers that have already been drained or, after the ground has been covered, they idle their time away. By this moving from place to place it is claimed that the bees are kept interested and enthusiastic at all times.

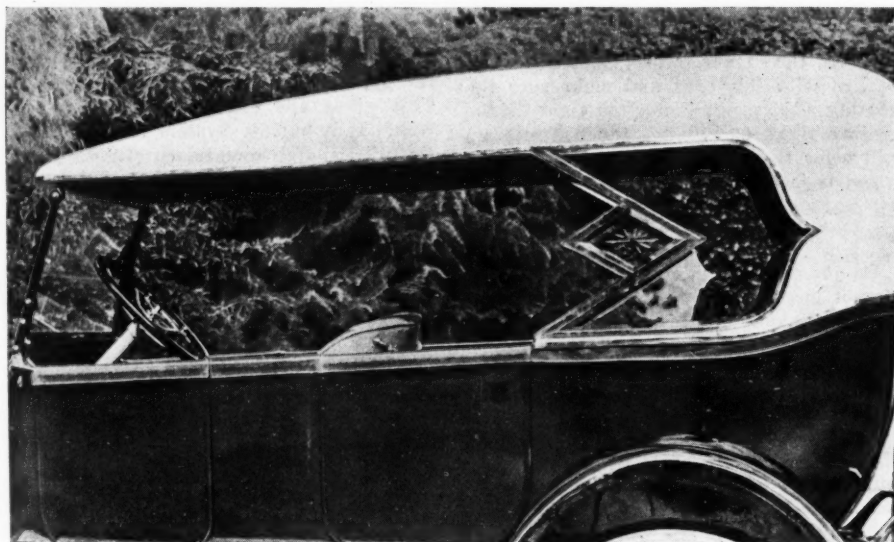
The bee keepers of Southern California have been experimenting for some time in the transportation of bees, but until the truck was introduced the work was anything but satisfactory. The work was done by horse and wagon and by freight and was tedious and expensive. The jolting wagons broke down the comb structures in the hives, and the long confinement while the journey was in progress always killed many bees, weakening the colonies.

A 1½-ton chassis and a special body with a carrying capacity of 100 hives do the work. In early spring Mr. Mercer conveys his hives by truck from the home ranch in Castaic canyon to the foothills above Glendora, something like 64 miles, where there are hundreds of acres of orange groves, the blossoms of which trees make splendid pasture for the bees.

After the bees have done their day's work and have retired for the night, the owner closes the entrance of the hives and places them within the truck, each load containing 100 hives. The transporting operation is done at night, so that while the bees go to bed at Castaic, they wake up in Glendora, 64 miles away. The road is smooth all the way and the bees and hives are in no way damaged. In three nights the entire apiary is moved. When the honey season at Glendora is ended the bees are transferred to the Ventura district, where they are permitted to remain for the summer season, when the blossoms of thousands of acres of bean plants are available. At the close of the bean blossom season the bees are carried again to their home ranch in the Castaic canyon, where they feed during the winter months on the blossoms of the sage brush on the mountain side.

The usefulness of the truck does not end in the transporting of the bees from place to place. It is also used as an extractor house. The house is equipped with a power extractor, driven by a gasoline engine. By having the truck so equipped it is not necessary to move the hives.

New Use for Wedding Cut Glass



If your friends and relatives shower you with a superfluity of cut glass on the happiest day in your life, maybe your car can benefit by it as this car has by cut glass

ONE of the latest features to be employed by one of the motor car manufacturers of this country is the use of cut glass in connection with the top. This top is of the very latest design, being of the one-man order. Extending upward from a

point near the back of the rear seat is a metal framework. Between this and the back of the top is a solid piece of plate glass, while the small diamond-shaped piece of glass located within the framework itself is decorated by a design.

The Readers' Clearing House

Conducted by B. M. Ikert

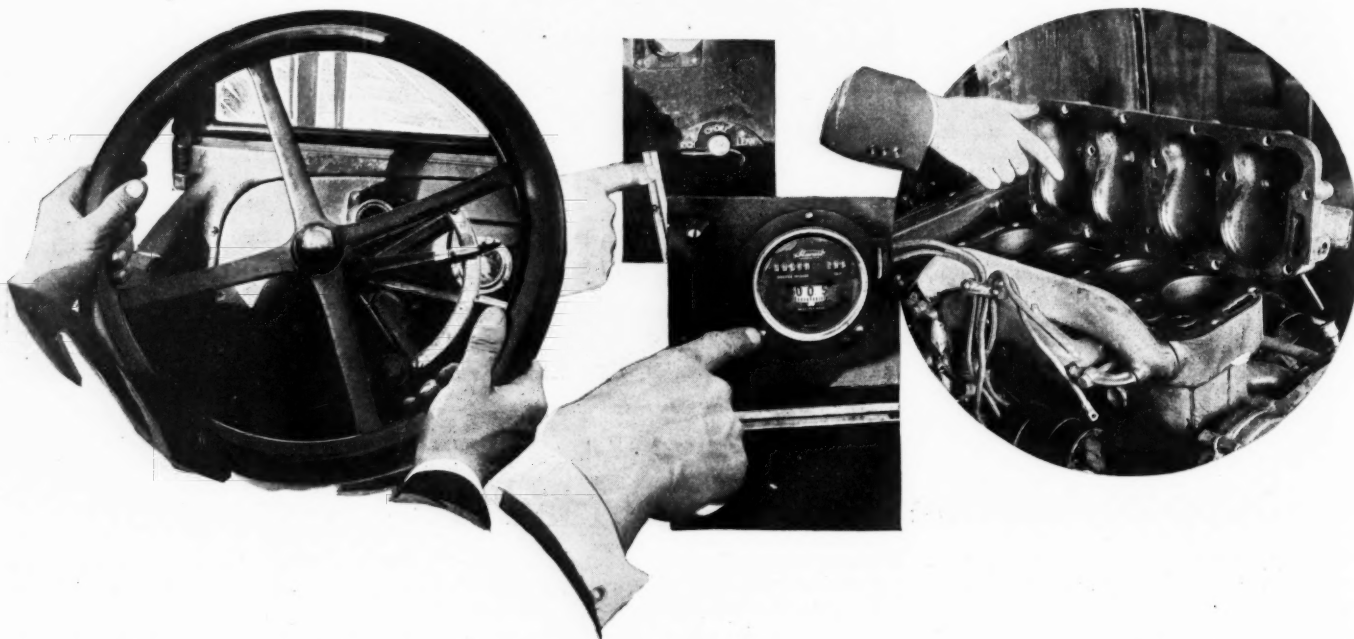


Fig. 1.—To drive economically run with the spark advanced, shown at left, keep the mixture lean, watch the speedometer and remove carbon frequently

Ten Commandments of Fuel Economy

MANY drivers operate their cars under what they consider economical conditions, whereas with a few adjustments and attention to detail they could in some cases almost double their miles per gallon. There is a large percentage who do not know the fundamentals of driving for economy. Given a good car, there is no reason why it should not be run at the most efficient and economical point if the little details and daily attention necessary are given, which the manufacturer intended they should make. There is no secret of running economically. It is up to the man who runs or takes care of the car. Herein are given ten important factors to be considered in tuning a car to get the best possible condition of running on the least amount of fuel.

1—Lubrication

This takes in not only engine lubrication but the chassis as well. See that the engine is supplied with just the right amount of oil. Too much oil is as bad as too little. Find out by several trials the correct level in the crankcase to be carried at which the engine seems to operate best.

The car must roll easily. This means the wheel bearings and axle bearings should be oiled or greased periodically. Do not use too heavy a grease in the differential. In fact, wherever possible use oil. Where heavy grease is used the gears have to churn this and the grease is thrown against the housing but does no good as far as lubricating gears is concerned. When oil is used even though thrown on the housing it will run to the bottom of the case

and will be picked up again by the gears.

The gearset also should have in it a very light grease or gearset oil. The universals get considerable wear and if this is not compensated for or guarded against the wear will cause a jerky action of the car, especially when accelerating or slowing down.

Keep the front wheel bearing well packed with lubricant and make sure the bearing adjustment is not too tight. Have it just tight enough so the valve stem will come to rest at the bottom when the wheel is jacked from the ground.

2—Cooling

Do not run with your engine over-cooled. Do not get the idea that because you can put your hand on the radiator or engine without suffering discomfort that everything is well with the cooling system. True, the engine is not running hot, but at the same time the best economy is not obtained under these conditions. Experience shows that the best temperature at which to run an engine is with the water in the jackets just below boiling point.

Try running with the fan belt removed. Install a Moto-Meter. This will give you ample warning if the engine is tending to run too hot. As long as the Moto-Meter remains at the normal position you may be sure there is no danger.

If the water continues to boil easily, it may point to insufficient lubrication, or the water may be syphoned out, sometimes the case in mysterious overheating. After filling the radiator drain out about a pint

or so of water to guard against syphoning. Do not let the engine get so hot that it begins to pound.

3—Ignition

Fuel economy is not obtained with poor ignition. The spark must be hot enough to completely ignite the charge. Adjust the spark plug gaps as wide as possible. This gives the engine a chance to idle well. If a battery system is used, watch the distributor points carefully. They must be taken up from time to time to give the best results. Dress them with a dead smooth file. Watch the spark position carefully. It should be advanced as far as possible at all times and retarded only when pulling hard or ascending a bad hill.

4—Carburetion

Sometimes simply turning the needle valve a trifle will give a marked improvement in the miles per gallon obtained. Most drivers run on a mixture altogether too rich. A rich mixture causes the engine to lose when the throttle is open, and while some of it is consumed in the combustion chamber, much of it is thrown out of the exhaust unburned or partially burned, with considerable waste.

Test the richness of the mixtures by quickly opening the throttle with spark about half advanced. The engine should accelerate with a snappy action. If it does not, cut off the gasoline at the needle valve slightly and try again. Keep this up until there is a slight popping-back in the car-

bureter. This indicates the mixture is too lean. The needle valve should be set back to give a slightly richer mixture, sometimes only one notch.

Watch out for gasoline leaks. Sometimes a slight leak at the tank outlet or carbureter inlet is opened by vibration when the car is running and much fuel is lost without having done an ounce of useful work.

Do not allow the carbureter to drip continuously. A leaky float valve should be ground in to make it tight and prevent flooding.

5—Carbon

Keep the engine free of carbon deposit. This saves gasoline and makes a smoother running job. Carbon eventually gets under the valve seats, preventing them from closing properly. The result is that compression is poor, and the explosion weak. This means loss of power and a general falling off in fuel mileage. By carefully cutting down the mixture and with just the right amount of oil, proper ignition, etc., there should be a minimum of carbon trouble.

6—Brakes

See that the brake adjustment is correct. Jack up the rear wheels and start the engine, throwing the gearshift lever in first speed. Have some one throw out the clutch and apply the brakes while you watch the rear wheels. They should both stop at the same time. If one stops sooner than the other it shows that the brake band is too tight. If, with the wheels jacked up, there is a grinding noise from one drum when the brakes are released, it also shows the brakes are too tight. In relining brakes be careful to get the lining to fit snugly on the band. It should not be stretched straight from one rivet to another, making a sort of polygon figure, because the high spots tend to bind on the drum.

7—Tires

The car must roll easily. This means the tires must be inflated so they are perfectly round. This reduces the amount of frictional surface and the car moves easier. Running tires too soft flattens them under load and makes the coefficient of friction greater, besides being bad for the tires.

8—Springs

Keep the springs oiled. Either separate the leaves and graphite them thoroughly about once a month or use one of the patented oiling devices. At any rate the leaves must slide freely upon each other. It is a step toward fuel economy, because if the springs are not greased they will stick together and in going over a bump the engine has to lift the entire weight of the body and occupants, in addition to propelling the car. When the springs are lubricated this does not occur, because the body literally floats along, due to spring action.

9—Drive Moderately

Economy is never secured by driving at widely different throttle openings, nor is it well to rush up to a corner and quickly apply the brakes only to open violently

to assist readers in obtaining as a unit all information contained in this department on a certain subject in which they may be most interested, MOTOR AGE segregates inquiries into divisions of allied nature. Questions pertaining to engines are answered under that head, and so on.

ENGINES

Reader.....Brooklyn, N. Y.
Reader.....St. Louis, Mo.
R. A. Colby.....Bakersfield, Cal.
O. W. Schacht.....Milwaukee, Wis.
E. Huber.....Los Angeles, Cal.
R. John Wilson.....Cleveland, Ohio
R. A. Hoyt.....Lake City, Minn.
V. V. Pool.....Nevada, Ohio

THE ELECTRIC SYSTEM

D. A. Pierce.....Utica, N. Y.
Odis L. Shartzler.....Freeport, Kan.
A. H. Roehr.....Dayton, Ohio

MISCELLANEOUS

John Henck.....Everly, Iowa
Odis L. Shartzler.....Freeport, Kan.
E. Huber.....Los Angeles, Cal.
Irving Isenberg.....Chicago
J. Mohammed Ali.....Detroit
Esca Forgy.....Shamrock, Tex.

REBUILDING

W. L. Calkins.....DuBois, Pa.
Hardy & Bailey Garage.....
.....Monticello, Ark.

No communication without the writer's name and address will be answered in these columns.

the throttle again upon making the turn. The most economical speed for most cars is 20 m.p.h. or thereabouts. So far as possible this speed should be maintained and full advantage taken of coasting. Discretion must be used in the latter, for instance, in going down a hill better economy often is obtained by letting the engine tick over slowly with the throttle closed and clutch thrown out, than if the engine were stopped altogether and started up again.

Care must be exercised also in handling the clutch. A slipping clutch allows the engine to speed unnecessarily and more gasoline will be used traveling a certain distance than if the clutch were holding properly. Do not ride the clutch pedal. This means that you must not keep the foot carelessly on the clutch pedal, for the tendency will be to depress it slightly and cause slipping of the clutch.

10—Adjustments

Do not make hasty adjustments. Do not go about the car aimlessly jumping from one item to another. Work systematically. Take, for instance, the ignition system first and check it all the way through before going to the carbureter. Do not jump at conclusions. Many make the mistake of thinking that the manufacturer has fitted the wrong kind of carbureter, where-

as the instrument might need a slight adjustment of gasoline or air. Make all engine adjustments under running conditions. Just because an engine runs well in the garage with the car idle is no sign that it will pull properly under load on the road. All adjustments should be made also with the engine warmed. Do not let several persons handle your car. Make your own adjustments and in this way you will find out the peculiarities of the car. You must have a starting point to work from and once you get this established go in the direction which ultimately gives the desired results.

Engines

Position of Crank Throws

Q.—How far apart would the crank throws of a crankshaft be set on a four-cylinder two-cycle engine, in degrees, so it would fire four times in a revolution, power strokes 90 deg. apart? How many degrees apart on a six-cylinder two-cycle engine? Show sketch of both shafts.—Reader, Brooklyn, N. Y.

In a four-cylinder two-cycle engine the crank throws are set at 90 deg. A crank of such an engine consists practically of two two-throw 180-deg. cranks, as shown in Fig. 2. The firing order of such an engine would be 1-4-2-3.

A six-cylinder two-cycle engine would have a crank of exactly the same form as the six-cylinder four-cycle engine. This also is shown in Fig. 2.

Figuring Engine Horsepower

Q.—Using formula $\frac{63,360 \times \text{m.p.h.} \times \text{gear ratio}}{\text{tire diameter} \times \pi \times 60}$ = r.p.m. and figuring from maximum r.p.m., would m.p.h. obtained be m.p.h. that car would develop, or how much loss must be allowed for? 2.—Is there much variation in maximum r.p.m. developed in the block test of any two engines? If so, how much? 3.—Recently on a Packard demonstration the speedometer showed 80 m.p.h. and in using the formula the r.p.m. would be about 3450. Is that possible in a stock Packard engine?—Reader, St. Louis, Mo.

1.—The formula quoted for the revolutions per minute of the engine is correct. The maximum revolutions per minute of the engine is a somewhat indefinite term. Of course, the engine reaches its maximum speed if it is allowed to race under full throttle without load. This is a dangerous condition of operation, and it certainly does not do the engine any good. As this is of no practical value, it is not generally determined. What is of much greater importance is the r.p.m. of the engine at which it develops its maximum horsepower. When the engine races under full throttle

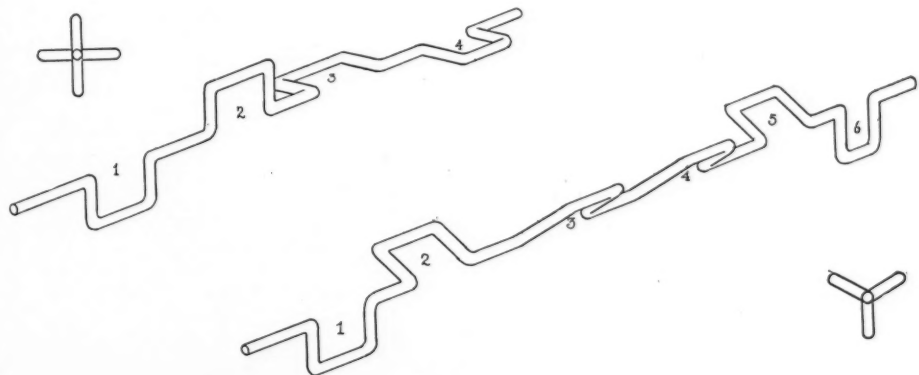


Fig. 2—Layout for four-cylinder and six-cylinder two-cycle engine crankshafts. The six-cylinder is the same as used in a four-cycle engine

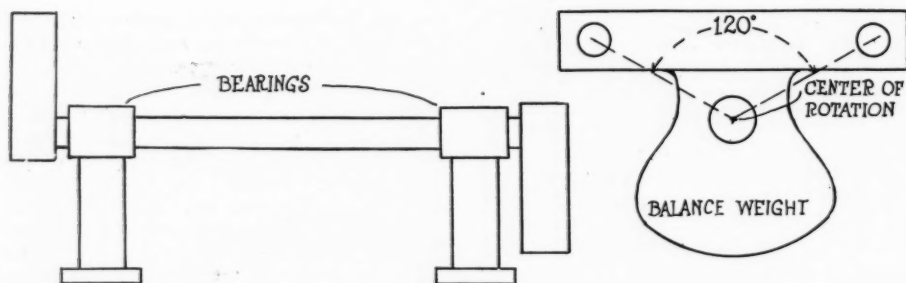


Fig. 3—Shaft in static balance. Centrifugal force on one arm is equal and opposite to the other

without load, it, of course, develops no useful power at all.

2—The maximum r.p.m. of stock engines is not generally determined and we are therefore not able to give you this information.

3—The Packard stock engine develops its maximum power at about 2700 r.p.m. and is capable of running up to about the speed you mention. In the recent Chicago race de Palma stated that his engine turned over at 3400 r.p.m. when he broke the track record in his Packard.

Duesenberg Engine Users

Q.—What manufacturers beside Revere and Roamer use Duesenberg engines? Does anybody put a speedster on the market with the Duesenberg engine? Did LeCocq drive a stock Roamer at the Ascot and Bakersfield races? Have you a picture of the Roamer racer, and what is Louis LeCocq's address?—R. A. Colby, Bakersfield, Cal.

The Duesenberg engine is used in the Wolverine car, in addition to the ones you mention. This is a roadster.

The Roamer driven by LeCocq was not a stock car, just as other racing cars are not stock. They are all special jobs. The engine used by LeCocq was the same as that fitted to the Roamer. A picture of this car was published in last week's issue of MOTOR AGE. LeCocq has entered the Naval Reserve Flying Corps, but mail will reach him in care of the Pacific-Roamer Distributing Co., San Francisco, Cal.

Engine Used in Enger

Q.—Did the Enger car manufactured in Cincinnati in 1913 use a Continental engine, or was it assembled?

2—Is it advisable to have a crankshaft welded?

3—Where can I buy a second-hand crankshaft for model F 1913 Enger?—O. W. Schacht, Milwaukee, Wis.

1—This was a Continental engine.

2—While it is possible to have a crankshaft welded it is not advisable. The crankshaft takes considerable strains, and a poor job of welding would be apt to let go any time.

3—We suggest that you refer to the advertising section of MOTOR AGE, where you will find listed concerns dealing in used car or engine parts.

1916 Hudson Engine Data

Q.—What is the ratio of clearance to piston displacement on a Hudson 1916 40, using Continental engine?

2—What is the initial pressure expansion stroke after explosion takes place?

3—What is the thickness of the cylinders?

4—What is the tensile strength of the material of which they are made?

5—Is the tensile strength affected by temperature?

6—How many revolutions does the crankshaft make when the engine develops its maximum power?—E. Huber, Los Angeles, Cal.

1—The ratio of clearance to piston displacement is 26 per cent.

2—The initial pressure following the expansion stroke would be approximately 300 lb.

3—The thickness of the cylinders and cylinder head is $\frac{3}{8}$ in.

4—The tensile strength of the material is between 1500 and 1800 lb. to the square inch.

5—Provided the cooling system is in working order and has its full quota of water the tensile strength is not affected by the temperature.

6—The crankshaft makes 1800 revolutions at the peak of the power curve and delivers 46 hp. at this point.

Counterbalancing Crankshaft

Q.—I have a four-pin five-bearing crankshaft and want to know how to dynamically balance it. There are several engine and car manufacturers here and I wonder if I could have the work done.—R. John Wilson, Cleveland, Ohio.

Counterbalancing a crankshaft eliminates vibration and produces a much smoother-

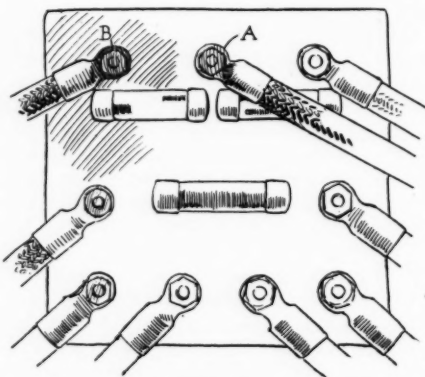


Fig. 4—Dash panel and fuse block of Maxwell, showing wires that must be disconnected when generator keeps on running after stopping engine

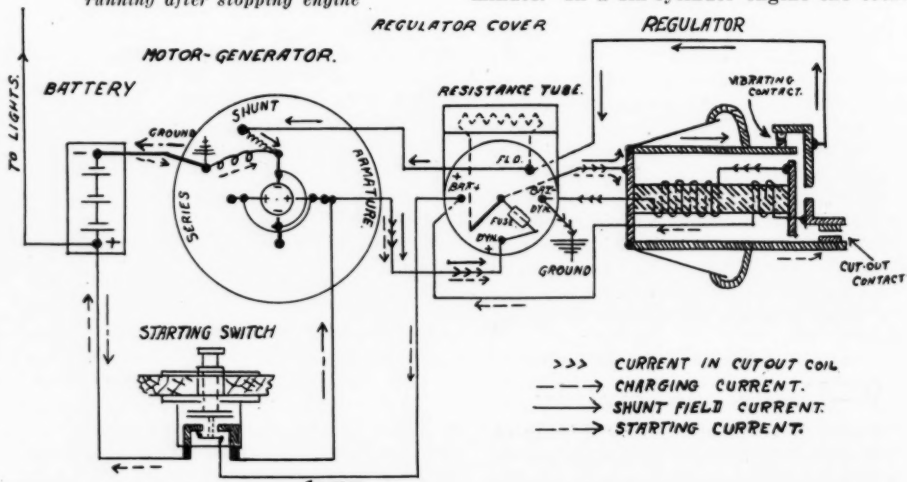


Fig. 5—Wiring diagram of 1915 Grant, showing action of current regulator

running engine. It allows greater engine speed and lessens considerably the wear on the bearings.

A distinction must be made between rotating and reciprocating parts, also between over-all balance and local balance. For instance, a mechanism like the one shown at left in Fig. 3 is in over-all balance, or static balance. It will remain in any angular position in which it is placed, and the centrifugal force on one arm is exactly equal and opposite in direction to that of the other. It is obvious, however, that the centrifugal forces on the arms will produce pressures on the bearings adjacent to them. The bearing load resulting from the centrifugal force on one of the rotating arms can be eliminated only by placing a counterweight directly on the arm.

This is practically all there is to the Hudson crankshaft. On each crank arm is a weight which exactly balances the arm and half of the adjacent crankpin or pins. It has been done previously in the case of crankshafts which have a supporting bearing between each pair of throws. Stearns, for instance, did it, but the Hudson company seems to have been the first to apply these counterweights to multi-throw cranks with crankarms with connecting crankpins 120 deg. apart. To these arms the balance weights necessarily must be applied at the side.

In balancing rotating parts the moments around the crank axis must be equal. As a pair of crankarms and the crankpin between them constitute a definite moment, the balance weights must be made to form an equal moment. The moment is equal to the product of the weights into their distance from the axis of rotation, measured from the center of gravity of the balance weights. The connecting rod head and half of the connecting rod shank may be considered as rotating parts and be balanced in the same way as the crankarms.

The reciprocating parts, including the pistons, rings, pin-locking device, bushing and half of the shank of the connecting rod by their inertia produce a vibrating force in the cylinder axis, which varies in intensity and changes in direction. This force is directly proportional to the weight of the reciprocating parts, directly proportional to the length of stroke and proportional to the square of the revolutions per minute. In a six-cylinder engine the total

---> CURRENT IN CUTOUT COIL
 ---> CHARGING CURRENT.
 ---> SHUNT FIELD CURRENT.
 ---> STARTING CURRENT.

reaction on the engine frame due to the inertia of the reciprocating parts is always zero. Suppose, for instance, that one pair of pistons is moving up and the other two pairs moving down, then the inertia force on the first pair is equal and opposite in direction to the algebraic sum of the inertia forces in the other two pairs for every position of the crankshaft. Thus, in a six-cylinder engine there should be absolutely no vibration due to the inertia of the reciprocating parts. This inertia, however, will cause bearing pressure, because the parts which balance each other relatively are located on opposite sides of the bearings.

Reciprocating forces cannot be fully balanced by rotating forces such as centrifugal forces on rotating weights. The best that can be done is to reduce the maximum value of the reciprocating force by half. The principle by which this is accomplished is as follows: A rotating force may be resolved into two reciprocating forces at right angles to each other. By a reciprocating force is meant a force, always acting in the same line but changing periodically in direction. The centrifugal force on a crankshaft balance weight may be resolved into a horizontal and vertical reciprocating force. If the balance weight is down when the piston is up, the vertical component of the balance weight centrifugal force will be opposite in direction to the inertia force of the piston. By making the two equal we would entirely eliminate the vertical force, but since we would then have an equal horizontal force we would gain nothing. But by making the vertical component of the balance weight centrifugal force equal to half the maximum value of the inertia force, we cut the latter down half. Of course, we also introduce a horizontal force equal to this half, but this is not so objectionable.

Cause for Overheating

Lake City, Minn., Editor MOTOR AGE—I notice one of the readers having trouble with a Ford overheating. I heard of a similar experience recently which was rectified by supplying new gaskets to the exhaust manifold, where it is bolted to the engine.—R. A. Hoyt.

Timing of 1913 Oakland

Q.—Publish diagram of a model 42 1913 Oakland touring car, showing correct valve timing. I have a car for repair and the engine acts as if the valves were too late.—V. V. Pool, Nevada, Ohio.

We have no timing diagram of this model but believe you will have no trouble in

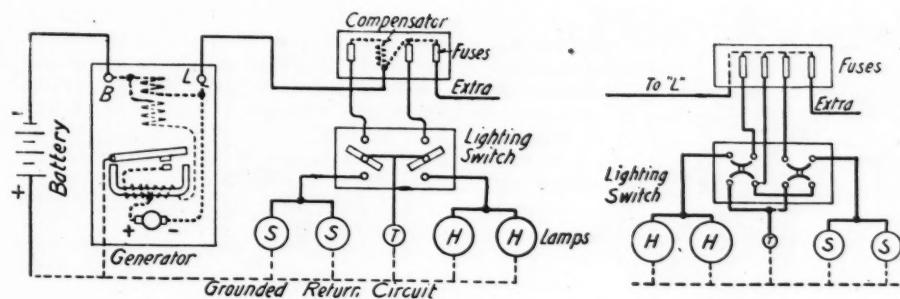


Fig. 6—Wiring diagram of the Westinghouse starting and lighting system used on the 1914 Marion. Left, connection with two-pole switch; right, connections with four-pole switch

checking up the valve timing if you remove the timing gearcase cover. You will find a punch mark on the large cam gear on one of the teeth. This tooth should come between the two teeth on the small crankshaft gear, at which point is another mark. If this is the case, your valves are timed right, although the distance between the valve stems and tappets may be incorrect. This has nothing to do with the setting of the camshaft, however.

The Electric System

Action of Current Regulator

Q.—Show action of current in the dash current regulator of Allis-Chalmers used on 1916 Grant.—D. A. Pierce, Utica, N. Y.

There are three different currents that pass through the regulator as indicated in Fig. 5. The cut-out coil, which is of high resistance and takes but a very small current, is connected permanently across the terminals of the motor-generator. When the motor-generator is driven fast enough to generate about $7\frac{1}{2}$ volts enough current passes through this cut-out coil to close the cut-out contacts. When these contacts close, the charging current can flow from the motor-generator to the battery, passing through the series winding in the regulator. This adds to the strength of the iron core of the regulator and holds the cut-out contacts together tighter and tends to open the vibrating contacts. The shunt-field current of the motor-generator passes through the vibrating contacts when they are closed and through the resistance unit when open. When the charging current reaches a certain value, the vibrating contacts are pulled open, forcing the shunt-field current to pass through the resistance unit, which reduces the voltage of the motor-generator, causing the charging current to decrease until the spring pressure

again closes the vibrating contact. As this action is very rapid, the vibrating contacts open and close very rapidly and the charging current is held approximately constant over a large range of engine speed. When the engine is stopped, a momentary reverse current flows from the battery through the series coil of the regulator to the motor-generator and neutralizes the effect of the cut-out coil of the regulator and thus causes the cut-out contacts to drop open, disconnecting the motor-generator from the battery.

Battery Run Down

Q.—On my 1917 Maxwell 25, with engine idle, lights are good, starter works strong, but upon slowing down for a corner or rough spot, the lights become very dim. My battery is in rather poor condition, only testing about 1150 or 1200. Also the battery container and sealing compound on top of battery are badly cracked. Could this be the cause of poor lights at low speed?

2—What can I do to prevent the automatic cut-out points from sticking and failing to charge as they should? How can I adjust these points to charge sooner?—Odis L. Shartzer, Freeport, Kan.

1—There is no question but what the battery of your car is in bad condition. In the first place it does not test as high as it should, and the fact that when you slow down the engine the lights grow dim is evidence of battery deterioration. We suggest that you remove the battery and take it to a service station for inspection and have the top sealed with new compound. It also should be given a slow charge to bring the gravity up to at least 1250. A rundown battery is always the result of lack of charge or waste of current. If, after having been fully charged, the battery soon runs down again, there is trouble somewhere in the system and it should be located at once.

2—Should the cut-out points stick at any time, it will be indicated by the ammeter needle going to the limit of the scale on the

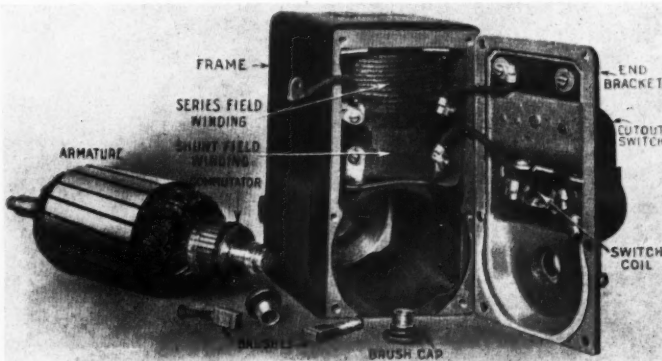
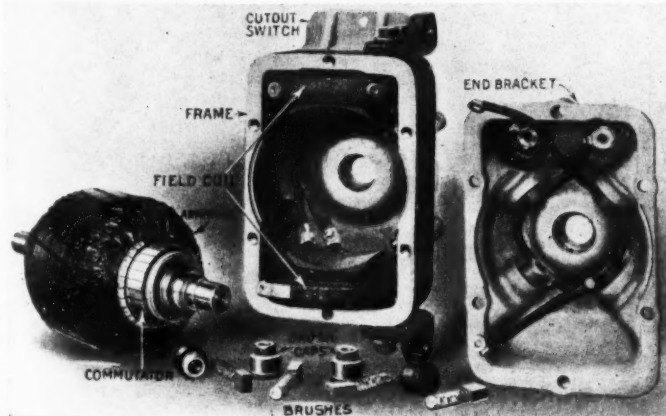


Fig. 7—Interior of Westinghouse generators, showing the connections, armature removed and other parts

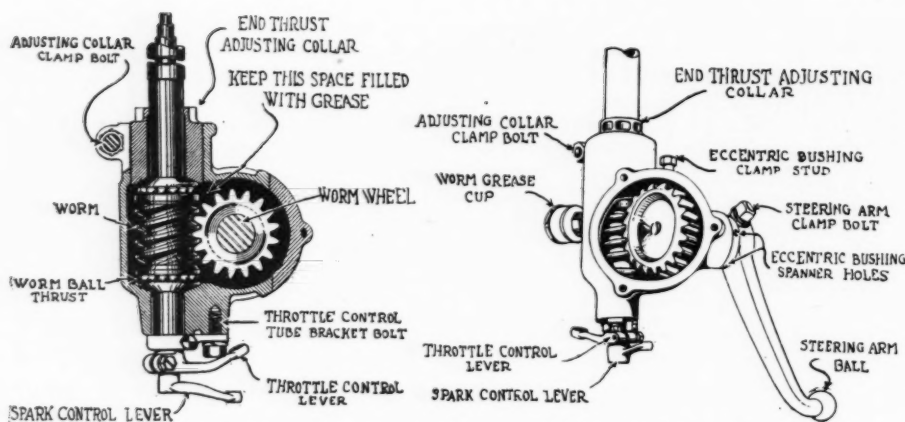


Fig. 8—How wear is taken up in the steering gear of the Overland 90. Generally all the wear can be eliminated by adjusting the eccentric bushing

discharge side and the generator continuing to run after the engine is stopped. If this occurs, immediately remove the charging wire marked A in Fig. 4 and B, the field wire, from the generator. Wrap these terminals with friction tape to prevent grounding. Failure of the regulating relay to work will be indicated by a very high charging current being shown on the ammeter. In cases of this kind do not attempt to correct the matter yourself but consult the nearest service station. This is particular work, and the adjustment can be spoiled easily by one unfamiliar with the construction of the relay unit.

Does Not Charge Properly

Q.—I have a Westinghouse generator on my Marion car and am unable to make it charge properly. Publish full internal diagram of the Westinghouse generator, type B.—A. H. Roehr, Dayton, Ohio.

An internal wiring diagram of the Westinghouse generator used on this car is shown in Fig. 6. If the battery does not stay charged it may be due to one of the following reasons:

A—The car is not run enough without lights, or at high enough speed for the generator to charge the battery to replace the current that is taken out when the lamps are burning with the engine idle, or running at very low speed.

B—A ground in the car wiring. With the engine idle and light off disconnect the battery wire and touch it lightly on the battery terminal a few times. If a spark is produced there is a ground in the wiring between the battery, generator and switch, or the magnetic switch in the generator is not open.

C—The magnetic switch in the generator is not operating properly. Examine the switch and see that it is connecting and disconnecting the generator circuit from the ground properly.

The switch should be in open position when the engine is not running or should stay in a closed position when the engine is running at greater speeds than 8 m.p.h. This cut-in speed varies with different sizes of generators, car ratio, size of wheels, etc. If the switch does not close, there may be oil on the brushes or commutator, or one of the brushes may be too short.

Miscellaneous

Water Syphons from Radiator

Q.—I have a Nash six, series 681. It has run about 1500 miles. The engine gets hot easily. After running about 25 to 30 m.p.h. for 5 or 6

miles, it will boil and steam. I can find nothing wrong with the engine and the spark is good. The carburetor is set as lean as it will work well, pump is working, plenty of water and fresh oil. What is the matter with it and what is the remedy for this?—John Henck, Evely, Iowa.

No doubt this trouble is caused by the water syphoning out of the radiator. When filling the radiator with water, it should be filled to the top and then about 3 pt. drained off before starting the engine. This will bring the water to the proper level and prevent the danger of syphoning. It is also necessary to keep the fan belt properly tightened and to carry the spark within 1 in. from top of the quadrant at all times, except when the engine is making a heavy pull or a quick pickup from low throttle. The spark then should be retarded.

Adjusting Steering Gear

Q.—What is the proper manner of tightening the steering gear on an Overland, model 50?—Odis L. Shartz, Freeport, Kan.

To correct wear or lost motion in the steering gear first loosen the clamp bolt which clamps the steering column adjust-

ing nut and turn the notched adjusting nut shown in Fig. 8 to the right until all up and down motion of the steering column is gone. Next turn the steering wheel to the right or left to the full extent of its travel and after loosening the nut on the eccentric bushing clamp stud, turn the eccentric bushing until all motion between the worm-and-worm wheel is taken up. Then clamp the sleeve tight again. It is advisable to make this adjustment with the wheel turned to the extreme position, because most of the wear occurs on the worm wheel in its position when the car is being driven straight ahead. If it were so adjusted that no motion is present at this point in its travel it would be impossible to turn the wheel far in either direction without excessive binding.

If it is impossible to remove the lost motion between the worm-and-worm wheel by adjustment of the eccentric bushing, remove the steering arm from the squared end of the worm-wheel shaft, and after rotating the worm wheel through a quarter of a turn replace the arm in the new position. This will present a new surface for wear. Make the adjustment as instructed before and carefully tighten the eccentric bushing clamp.

Making Frosted Glass

Q.—How can I make frosted glass? Is there a booklet published on this subject?—Irving Isenberg, Chicago.

There are several methods by which glass may be frosted. Two of the most simple are the following:

Rub over with a little bag of muslin filled with fine sand, powdered glass, emery or grindstone grit and water.

Dissolve two tablespoonfuls of Epsom salts in 1 pt. of beer and apply with a stiff brush.

We do not know of a book devoted exclusively to this subject, as it is hardly wide enough in its scope to warrant such

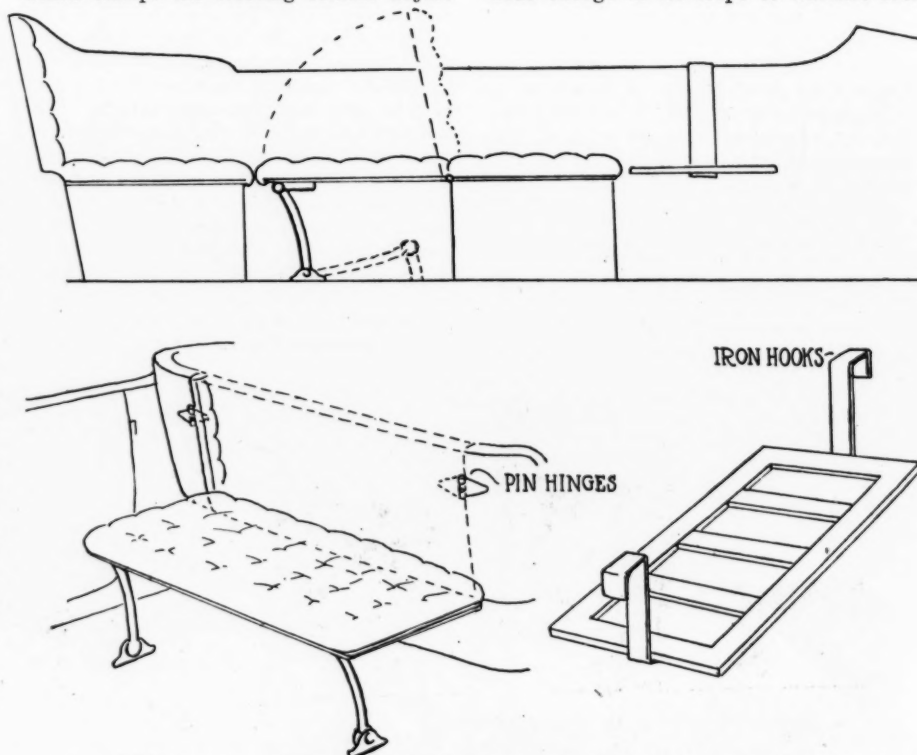


Fig. 9—How Motor Age reader made a Pullman out of his Ford car by arranging the front seat back to swing in horizontal position

a book. Formulas for this can be found in several reference books devoted to various industries. For instance, the "Scientific American Cyclopedia of Formulas" contains several formulas for frosting glass. This book is published by Munn & Co., New York.

Racing Terms Explained

Q.—Explain the following racing terms: Handicap, derby, preliminary heats and scratch man.

2.—Suggest a cheap way of producing an exhaust pipe that will make a Ford sound something like a larger car. I mean a rumbling sound like a racer.—Esca Forgy, Shamrock, Tex.

Handicap means giving an artificial advantage to a supposedly inferior contestant, when speaking of motor car races. For instance, if one car is capable of 100 m.p.h. and another 80, the latter might be given an advantage of 1 min. or so head start over the other in a 100-mile race, to give it an equal chance of winning. Derby is the name applied to a race of relative great importance. Preliminary heats are a series of races preceding a final. Thus eighteen cars might be entered for a 10-mile event to be decided by three cars winning the first three heats. Six cars might complete in the first heat and the winner would race against the winners of the next ones. Or, all the cars might run in the preliminary events and the first three of the first heat entered for the finals. These are mere examples, for the nature of the events is decided by the officials. The scratch man in a race is the last one to start in a handicap event. He must give all the other contestants certain advantages. Thus, what is considered the slowest car starts first, and as the scratch man is supposed to have the fastest car, he starts last.

2.—The rumbling sound of a race car is rather hard to produce with a car like the Ford. For one thing a racing car has a much larger exhaust pipe, different valve layout, larger carbureter, no muffler, etc. There are on the market several cut-outs

designed to intensify the sound of the exhaust, and this is about the best suggestion we have to offer. Another scheme you might try, provided you want no muffler, is to remove the latter and flare out the end of the pipe. Now get a large metal cylinder about 8 or 9 in. in diameter and 18 in. or so long and let the end of the exhaust pipe fit into it about 6 in. The forward end of the cylinder should be open and the rear closed except that a series of small holes should be made in the end to relieve some of the gases. The remaining gases will find their way out through the front. Another method is to rivet a funnel on the end of the exhaust pipe. This has been tried out by several drivers, and while it does not sound exactly like a Peugeot or Frontenac, it does help to intensify the sound. However, you must remember that many communities will not permit the use of a muffler cut-out.

Saluting with the Horn

Detroit, Editor MOTOR AGE—Quite often when driving one wishes there were a certain way in which the horn could be sounded to express "hello" when passing a friend and be understood generally by drivers. I wonder if some MOTOR AGE readers could make suggestions on this. It seems to me that some simple combination of telegraphic dot and dash could be fixed up, that would be quite different from ordinary warning and yet be short enough to work it quickly. The aim is to be able to say "hello" or "so long" through the horn.—J. Mohammad Ali.

Rebuilding

Sleeping in Ford Car

Q.—Publish instructions for cutting down back of front seat of 1917 Ford touring car to make it fill the space between the front and rear seats, so as to be used as a bed on touring trips. Also show the best method of supporting the back of the front seat after being cut, both in the raised and lowered positions.—W. L. Calkins, DuBois, Pa.

In Fig. 9 is shown a method of supporting the back of the front seat after it has been cut to make a bed. The hinges of the board that is under the front seat were taken off and hooks put on each end in such a manner that when they are hooked over the front doors when closed the board rests on a level with the seat cushions and this gives ample room. The hooks are lined with leather, and when this board is put back in place under the front seat cushion, the hooks are wrapped in rags or cloth, so they will not rattle against the ends of the gasoline tank. Measure down about 14 in. from the under side of the wood upholstery strip of the back of the seat which gives about the proper place to saw the back. By wrapping the hacksaw blade with friction tape and running the teeth of the saw in the reverse of ordinary so that the cutting stroke will be toward instead of from you the back can be cut easily. A template should be made for the seat edges so that reinforcement strips can be applied, and these should be of 1¼-in. material. To hold the front seat in place when up, one reader uses a pin hinge on each side and when the pins are in place there is no rattle or spread. In addition a foot rest is supplied which when folded up supports the seat back.

Rebuilt 1912 Chalmers

Monticello, Ark., Editor MOTOR AGE—Noticing many pictures in the Readers' Clearing House of rebuilt cars, we are sending two views of a 1912 model Chalmers we recently rebuilt. This car was a five-passenger. We built the body complete in our garage. The dash was set back 8 in. and a new hood made. The steering wheel was lowered and the levers arranged to be easily reached, with the seats in the new position. The body is painted a light gray, with red wheels. Deerskin is used on the seats for upholstery.—Hardy & Bailey Garage.

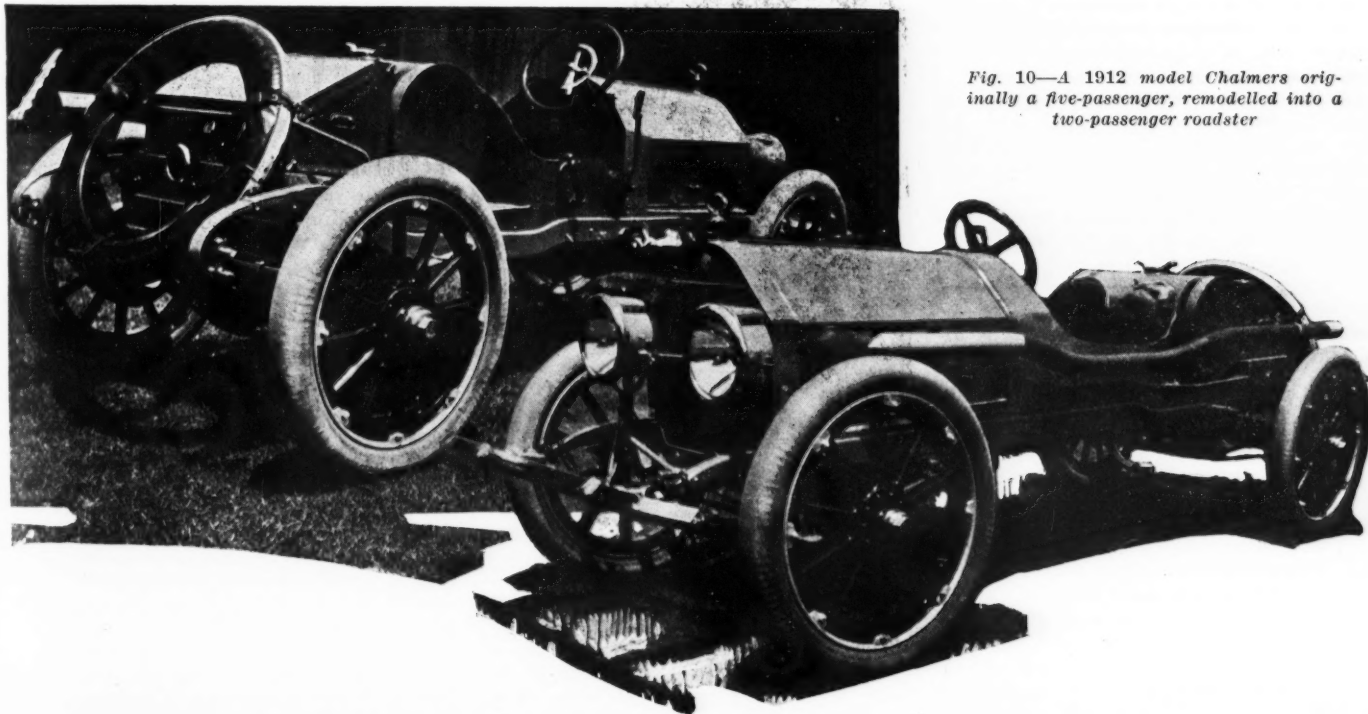
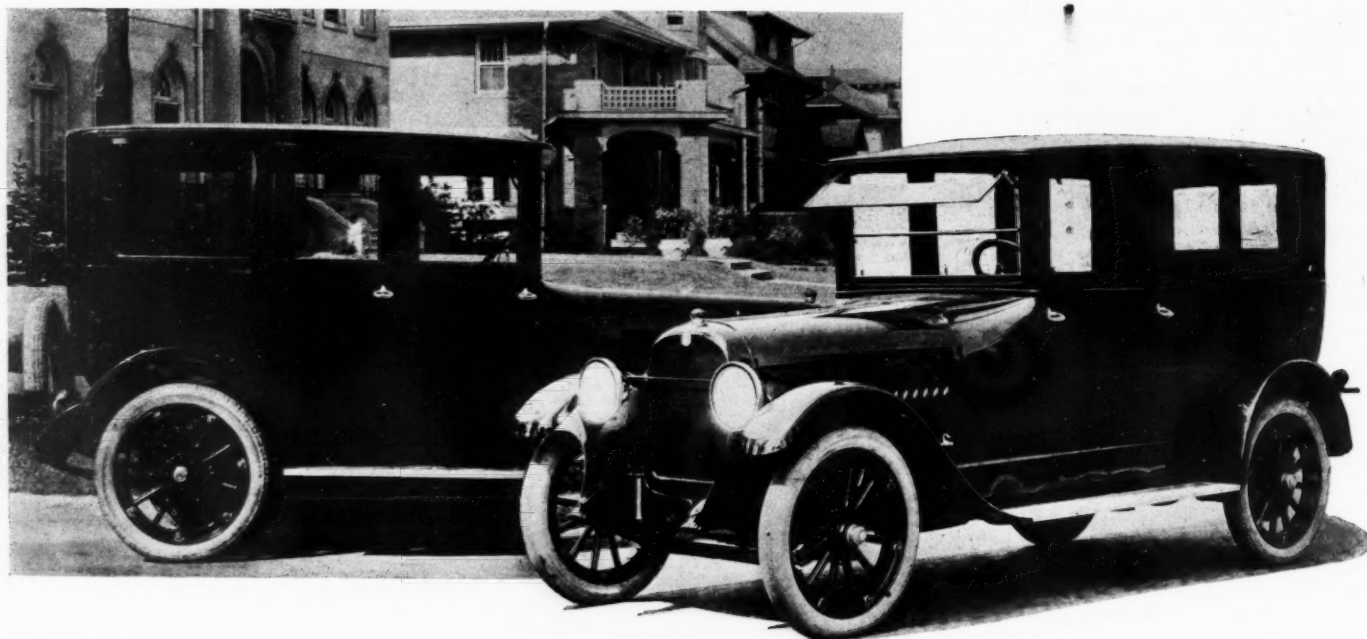


Fig. 10—A 1912 model Chalmers originally a five-passenger, remodelled into a two-passenger roadster

Solidity Marks Studebaker Sedan



The Studebaker light six, left, and the light four, right, sedans are shown above. There is little difference in the finish and appointments

STAUNCHNESS is featured in the construction of the new series 19 Studebaker sedans. All parts are made to fit the particular construction of these bodies, and every item of installation is interchangeable for the entire production, making it possible for a purchaser four or five years hence to obtain a window or some other part that will fit perfectly. While a sedan body is offered for both the light six and the light four chassis, there is very little difference in the finish and appointments.

Sweeping Lines

The sweeping lines of the series 19 touring cars have been carried over into the new sedan bodies. Eight solid upright posts extend from floor to roof and lend solidity. As an additional preventative against rattling, the slides in which the glass windows operate are provided with small rubber rollers which press against the edges of the glass and absorb the shocks and thrusts that are responsible for many closed car rattles. The glass is of one thickness for windows and windshield, making replacement easy.

A mechanical window-lifting device is fitted. The windows are raised or lowered by a small nickel-plated handle. The back window, which is permanent, is built into a rubber channel made V shape with a V lip on both sides of the top of the channel. This chokes the glass tight and makes the window rattle- and leak-proof. Heavy weather strips of the same material as the upholstery are placed around the door edges. Also, the sill plate has a beaded weather edge on the inside against which the door jams, shutting off any chance of draughts.



Upholstery is cloth in parallel pleats. Roomy pockets are on both sides of the seats. A cut glass dome light, operated by a switch, and silk roller curtains at the

At the left is shown the roomy tonneau of the Studebaker sedan. In the circle can be seen the locking device for the right front door

windows are interior features. A convenient handle makes it possible for driver or passenger to swing the doors closed easily and without having to reach clear out to the latch handle.

The two rear doors and left front door are locked from the inside by special lever locks. The right front door locks from the outside by a lock in the front sash.

The windshield is of the three-piece type, with adjustable visor. It is clear-vision, rain-vision and is easily adjustable for ventilation. All instruments are mounted on a jet black instrument board. The controls and instruments are identical with those of the new series 19 light four and light six touring cars.

The exterior is finished in Studebaker blue, with chassis and upper half of body in black. The prices are, light four, \$1,685; light six, \$2,185, f.o.b. Detroit.

DEALERS EMPLOY MORE WOMEN

Boston, Mass July 6—The shortage of men in the Boston motor colony is leading to the introduction of women on a larger scale. At the Alvan T. Fuller place, where the Packards are sold, there are some seventy-five women now on the payroll and the number increases every week. The gasoline filling station is in charge of a woman; another is handling the checking booth, where all cars going in and out are registered; another checks the cars and trucks going into the repair department; others run the elevators and more are in the painting, stock and other parts. Some of the other dealers are giving women executive positions, the Republic Truck Co. having placed in charge of a woman all the details of handling the employees, etc.

The Motor Car Repair Shop

Cutting and Fitting Gaskets

IN fitting gaskets to an engine or in any part of the car, for that matter, the important thing to remember is that the surface must be perfectly clean. For instance, if the crankcase joint has been taken apart and the gaskets removed, the metal surface on the flange should be thoroughly scraped and then reshellacked to make a tight joint.

Where cases are found in which considerable oil leaks from the engine, look for the poor joints where the crankcase joins to the cylinder block or where the bottom plate is fastened. Usually, the inspection plate or sometimes the lower half of the crankcase itself is made of pressed steel and the flange sometimes takes on a wavy condition as shown in the illustration. This means that the joints will be tight where the cap screws are open between them. An exaggerated view of this is shown. The proper remedy for this is to turn the case upsidedown and hammer the surface flat on an anvil. Also wherever possible felt gaskets should be used on such joints and should be from $\frac{1}{8}$ to $\frac{3}{16}$ -in. thick. When any gaskets are placed, examine the metal surface for defective spots. All blow holes or scratches must be filled properly. Use for this iron cement, commonly known as Smooth-On. There are also liquid preparations for this which may be applied in much the same manner as a filling is used on wood.

The best way of cutting paper gaskets is shown in the illustration. This applies only to such gaskets that can be made of heavy wrapping paper, as, for instance, those between the carburetor flange and the manifold. It consists of placing the paper over the joint surface and hammering it out with a hammer. The paper will be cut by the sharp closing of the joint as the hammer is brought down at an angle of about 45 deg. In cases where there are several holes, the paper can be held in position by using the ball end of the hammer

and hammering out two of the holes and inserting the bolts that go there. When this is done, lock the gasket in place and the rest easily can be hammered out. In applying paper gaskets only one side should be shellacked, because then the gasket very often can be used over again, as it will adhere only to the side that has been shellacked.

Frequently a good job of gasket cutting is spoiled by improper fitting. Thus the cap screws are not bolted down in the correct manner. Assuming that there are six cap screws on a circular plate, as that shown in the illustration, and a felt gasket has been placed underneath, the proper way to tighten it is to turn down the middle two cap screws at opposite points. Then two more are turned down at right angles to these, and finally the last set is tightened. None of the cap screws should

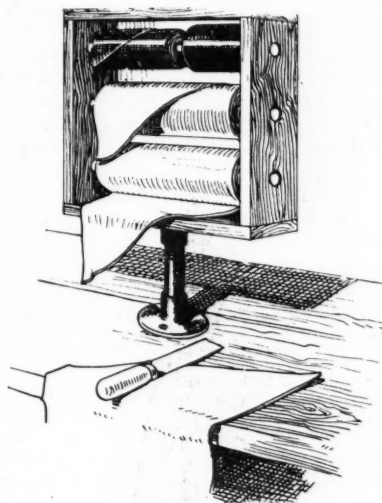
be firmly set at this stage. After the last ones have been set thoroughly tight, a wrench should be applied and the first two given a half turn. Go over the others in the same way, following this procedure until all have been set up completely. If one cap screw is tightened too much the plate is strained at that point, besides being on obliquely, as the other cap screws will not justify matters when set up. This means a leaky joint.

The bottle containing the shellac should have some support so it will not tip over easily. The following method is used in many shops: Bore a hole in a block of wood of the same diameter as the bottle to form a sort of place for it to stand in. An additional improvement is a groove cut in the block for the scraper used in cleaning the joint surfaces.

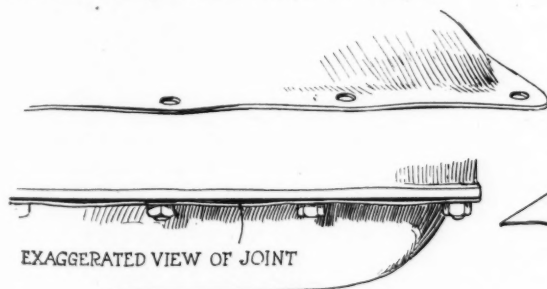
One of the objections raised to using felt gaskets with shellac is that the latter becomes hard and in this way makes the gasket inelastic. This is one of the advantages of using cork for gasket material. Cork gaskets cost a little more but aid materially in preventing oil seepage. Very often vibration causes a slight distortion of the crankcase and through the engine joints which the shellacked-felt gaskets are not able to contend with inasmuch as they are not elastic enough to fill the increasing space. Where much heat is met as in the cylinder head copper gaskets are used. Exhaust manifolds and exhaust pipe flanges are made tight with asbestos gaskets. If the gasket leaks after being set up tight, it is a mistake to still further tighten the plates in an attempt to remedy the trouble. It is better to remove the parts and inspect the surface, filing any projections.

Billiard table cloth is a material sometimes used for making gaskets to fit between the intake manifold and cylinder block where the joints are machined. This

(Concluded on page 47)

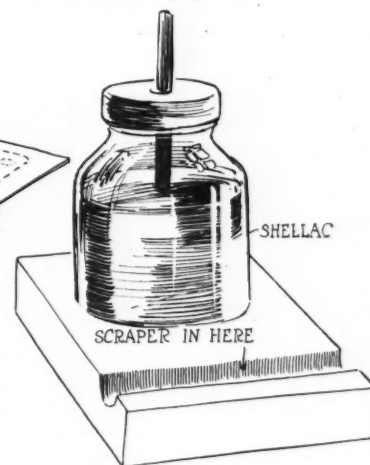
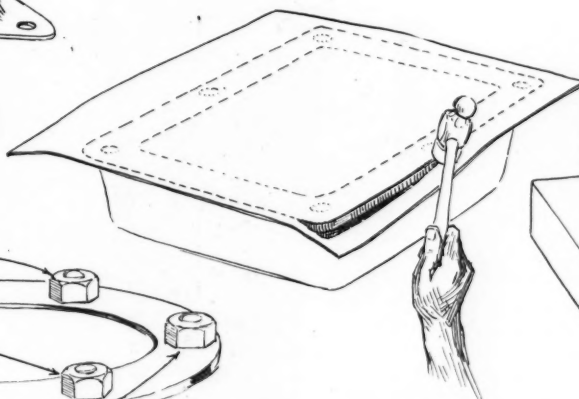
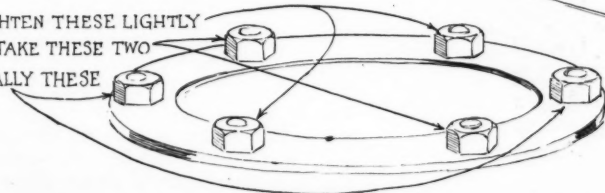


Gum and fabric rack which keeps stock clean and is handy to several men at same table



EXAGGERATED VIEW OF JOINT

FIRST TIGHTEN THESE LIGHTLY
THEN TAKE THESE TWO
AND FINALLY THESE

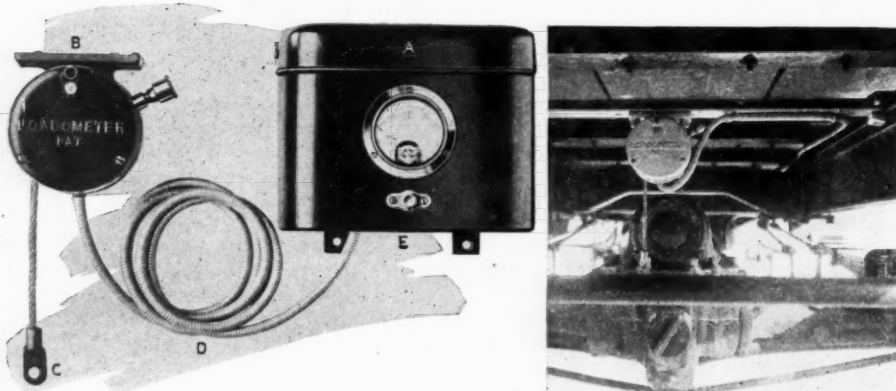


SHELLAC

SCRAPER IN HERE

Cutting and applying gaskets. At top, left is exaggerated view of leaky crankcase joint; lower left, tightening nuts to make tight joint; center, cutting paper gasket; right, shellac bottle block with groove for scraper.

The Accessory Corner



Loadometer installed on Mack truck, right, and equipment. A, pressed steel box containing two dry cells and the Loadometer; B, controlling rheostat; C, cable between rheostat and axle; D, flexible conduit for wiring; E, button for operating device

Gemco Luggage Carrier

THE Gemco luggage carrier is a device for attachment to the running board and carries suitcases, traveling bags, golf bags and parcels. When baggage is not being carried thumb screws on each of the two folders of the carrier can be removed and the device placed under the rear seat out of the way. The weight is 4 lb. The attachment is simple, being by thumb screw, and can be made in a very few minutes. Price, including two carriers and two straps, \$2.50.—Gemco Mfg. Co., Milwaukee, Wis.

Woodworth Spring Cover

The Woodworth spring cover and lubricator is made of black imitation leather, oil and waterproof lined with felt wicking. It is laced on over the springs, completely enclosing them. It acts as a lubricator through the felt lining, which is saturated with oil before application and will hold oil enough to lubricate the springs for a whole season. The device easily is fitted to any make of car, keeps out all moisture and dirt, as well as keeping in the oil so that the outside does not become greasy and dirty. Covers for twenty-seven cars are carried in stock, while those for other cars will be made to order. In ordering for other cars give length of covers required to reach from the U-bolts to the small end of the springs and the measurements around the springs at each end of the covers. Prices vary according to length of cover, from 40 cents for 12 in. or shorter to \$1.25 for over 24 in. Complete sets of spring cushions and lubricators are offered for the twenty-seven makes of cars and prices vary from \$2.10 for the Ford to \$9.50 for the Cadillac eight.—Woodworth Mfg. Co., Niagara Falls, N. Y.

Motor Dictograph

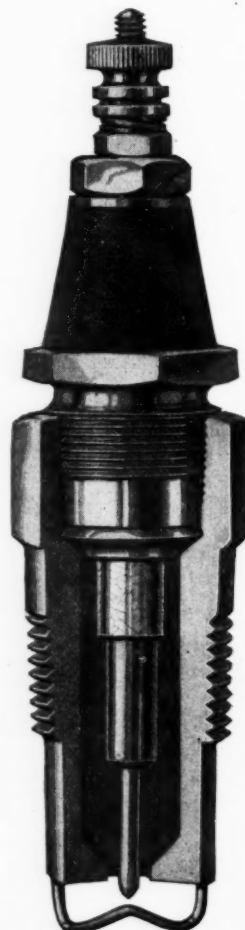
The motor dictograph consists of a sensitive microphone or telephone transmitter and differs from the ordinary telephone transmitter in that it uses a very thin wafer of carbon, highly polished by a special process, and transmits the sound vibrations from the carbon diaphragm through hollow carbon balls to the electros.

The ordinary telephone transmitter differs in that it transmits the vibration through a metallic diaphragm and carbon granules. The device can be built in the side of the car, has no movable parts and is operated simply by the pressure of a button. Type A is designed to be installed during the process of body construction. The transmitter is set flush in the side wall, either in the rear quarter panel or in the side panel beneath the window ledge and is

covered with a silver plate. Two push buttons on the window ledge or arm rest operate the device. Type B consists of a transmitter, buzzer and push buttons, all contained in a mahogany case $3\frac{1}{4}$ by $5\frac{1}{4}$ by 1 in. and can be installed in any closed car in a few minutes by a body builder, service station or garage without special tools and without cutting or marring in any way the upholstery or finish, it is claimed. The dictograph is operated by two dry cells placed beneath the driver's seat. It is a simple circuit and should trouble arise in articulation or transmission the first point to be inspected should be the batteries to see whether there are any loose connections or shorts. A pair of dry cells should last under ordinary usage from six to nine months and can be replaced by two dry standard dry cells when run down. If the fault is not in the battery, take off the transmitter plate or cover and see if the connections are tight. If the fault still is not found disconnect the top of the receiver on the horn and see whether the terminals are tightened properly. Do not take the transmitter apart, as the hollow carbon balls cannot be replaced except in the company's laboratories. Transmitters are replaced at any time within a year if damaged in any way except through carelessness.—General Acoustic Co., New York City.

Hesse Camping Trailer

The Hesse camping trailer is furnished on either pneumatic or solid rubber tires. It is mounted on either the truck or four-wheel trailer chassis. The four-wheel includes the steering device to make all four wheels follow identically the track of the rear wheels of the car. Connections for any car are provided. The trailer is built on the patented Hesse-Ludlow spring suspension which has a four-wheel steering device and has a patented shock-absorbing drawbar connection for attaching the trailer to the truck. The springs are attached to the axle by a shackle and hanger which oscillates when the load is applied and when running over uneven ground. The weight is entirely on the collar, or the strongest point of the axle with this construction. The camping trailer has waterproofed flies with awnings over the entrance and over the window at the front end. A large window in front and a window at the head, foot and side of each bed insure perfect ventilation. The beds are regular full size double beds in length and width. Bedrooms are separated by division curtains. At the side of each bed is a hammock, such as in a Pullman berth, which provides for clothes. At the head of each bed is a shelf for clothes, toilet sets, etc. All the necessary apparatus for erecting the trailer, which is done in 20 min., is carried on the wing boards at either side of the body. When ready for the road the entire trailer is covered with an enameled waterproof cover. To connect the trailer a filler block is placed under the bar in case of half-elliptic springs, or the cross bar can be shaped to fit the curve of the



Benford Golden Eagle spark plug

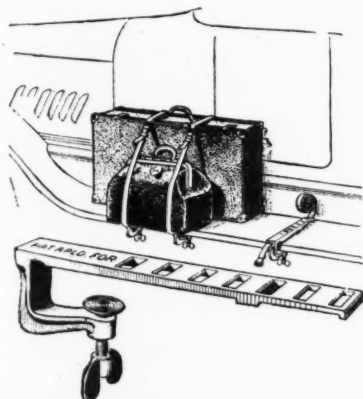
frame. With three-quarter elliptic springs the bar is applied directly. With cantilever springs two irons are bolted to the sides of the car frame and project past the rear end far enough to clear the gas tank or tire rack and the cross bar is attached to the turned ends. The drawbar cross member always should be located as nearly as possible midway between the rear axle of the car and the front axle of the trailer. This is to insure perfect tracking. The spring bolt and shackle bearing should be kept well oiled. Prices, mounted on four-wheel chassis, \$285; two-wheel chassis, \$210.—William G. Hesse & Son Mfg. Co., Leavenworth, Kan.

Mirroscope

Mirroscope is the trade name for a line of accessories put out in various models and consisting of lenses, mirrors, etc., as well as an individual windshield. The Mirroscope inclosed-drive model is placed over the front window in the body and enables the driver to see through the rear window without changing his position. This mirror is representative of the other devices. The individual windshield, which is made in all brass or heavy nickel plate brass, is adjustable and is for attachment to the steering post. This is made to clamp on a 2-in. bar with a $\frac{1}{4}$ -in. adjustment unless in the order the diameter of the steering post is specified. A combination of a 16-in. searchlight and a 4-in. mirroscope also is furnished. The Mirroscope is stationary when once set for vision and is fitted with a clamp to fit any style of windshield. Clamps to fit a variety of makes are supplied. Prices vary according to the model. The individual windshield sells at \$8, the combination searchlight and Mirroscope at \$8, while the plain Mirroscope may be had as low as \$4 for a 4-in. round size and \$2.50 for squares or ovals, with lower-priced models at 75 cents for bicycle and motorcycle mirrors and \$1 and \$1.50 for various other types.—J. Alexander Mfg. Co., 1931 Broadway, New York.

Benford Golden Eagle

The Benford Golden Eagle spark plug is adapted especially for tractor and truck engines. It is of substantial construction and tests covering 17,000 miles have been made in a tractor engine. The plug is made in eight sizes, $\frac{7}{8}$ in. regular, $\frac{3}{4}$ in. regular, metric, $\frac{7}{8}$ in. long, $\frac{1}{2}$ in. long, $\frac{3}{4}$ in. long and $\frac{1}{2}$ in. extra long. The plug is of the mica-insulated type. An inside



Gemco luggage carrier, showing details



Complete equipment for motor dictograph



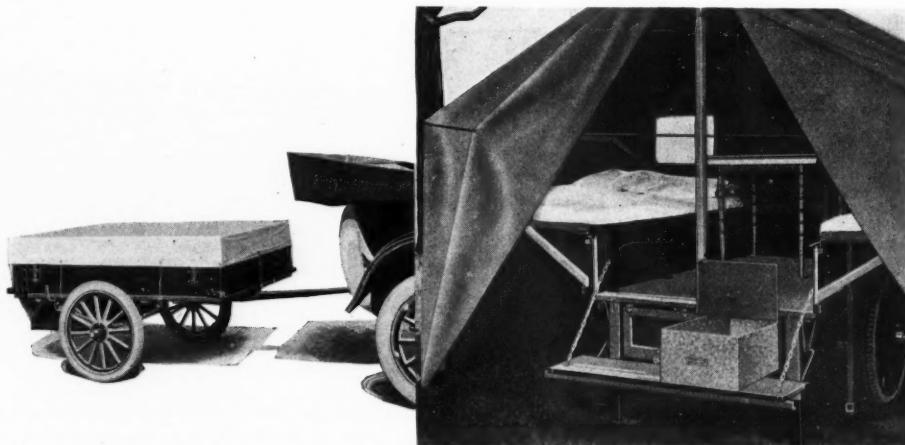
Woodworth spring oiler and cover, above, and individual mirroscope windshield

layer of sheet mica is wrapped tightly around a tapered rod. By a special method it is possible to wrap the mica tighter than is usually the case, and it is claimed at least a third more mica is put in the same space than by the ordinary method. The extra-tight winding is said absolutely to prevent short-circuiting by oil. A nickel electrode is welded to the bottom of the tapered central rod, and a nickel side electrode runs from one side of the shell to the other, curving around the central electrode in V fashion, as in the Golden Giant. The bottom of the plug is closed by a baffle plate, which has four holes through which

the combustible charge and the burning gas can pass in and out. The baffle plate keeps out oil, preventing the plug from fouling. It is also claimed the baffle plate confines the heat to the spark plug chamber and the resulting high temperature will burn any oil that may get into the chamber, thus making carbonization practically impossible. Only one gasket is used, $\frac{3}{4}$ in. thick and of copper. Stock plugs will be provided with double lock washers. Price, \$2.—Benford Mfg. Co., Mount Vernon, New York.

Loadometer for Trucks

The loadometer is a device which is placed on the dash of a truck to indicate the exact load carried by the vehicle. It is operated electrically and, in brief, consists of a rheostat which is bolted under the car and a Weston ammeter which is inclosed in a case with two dry cells and attached to the dash. The controlling rheostat, B, is bolted to the body or frame of the truck over the rear axle and the cable clip, C, is fastened to the axle. Between the rheostat and the ammeter is a flexible cable, D. A spring within the casing that holds the rheostat maintains the cable between the casing and the axle taut. As the body of the truck descends under the weight of the load, the spring takes up on the cable, permitting the arm of the rheostat to sweep over several contacts, reducing the resistance in the line between the battery and the ammeter. For example, when the truck is empty, the rheostat interposes the maximum resistance between the battery and the ammeter. As the truck is loaded and the body descends, the resistance is decreased so that a higher reading is given on the ammeter. The ammeter is calibrated to read in pounds so that if a 500-lb. load is put on the truck, this weight will be shown by the loadometer when the button, E, is pressed. Current is supplied by two dry cells carried in the pressed steel box that holds the loadmeter. As current is used only momentarily, the dry cells will last for long periods. The device is intended to indicate overloading and when once calibrated to a particular truck will remain accurate indefinitely. Adjustments are simple and the only moving part is the rheostat arm, which is lubricated by a felt wick. Price, installed, \$95.—Loadometer Co., Industrial building, Baltimore, Md.



Hesse camping trailer, mounted on two-wheel chassis at left and opened up

Among the Makers and Dealers



BLUE DEVILS OF FRANCE AND A COLE—On their recent visit to Indianapolis, Ind., these Blue Devils of France toured the city in a Cole Aero eight. Each soldier has been decorated for distinguished service while fighting on the western front

COSSEY to Represent Lane Truck—Louis W. Cossey has been appointed sales representative for the Lane Motor Truck Co., Kalamazoo, Mich., for Western Massachusetts and New York state.

St. Aubin Goes Into Service—R. J. St. Aubin, for several years traffic manager of the Federal Motor Truck Co., Detroit, has resigned to enter the service at Camp Custer, Mich.

Moon to Manage Farmer Boy Sales—E. B. Moon has been appointed sales and advertising manager for the Columbus Tractor Co., Columbus, Ohio, manufacturer of the Farmer Boy tractor.

Commerce Exceeds Its Truck Schedule—The Commerce Motor Car Co., Detroit, during May shipped in excess of 100 of the trucks ordered by the Government, and expected to more than double its initial output in June.

Barter Becomes McCord Vice-President—P. L. Barter, sales manager for the McCord Mfg. Co., Detroit, has been promoted to the position of second vice-president. He has been with the McCord company since its inception nearly ten years ago.

Wells Heads Philadelphia Oakland—Charles E. Wells has been appointed manager of the Philadelphia branch of the Oakland Motor Car Co., Pontiac, Mich. He has been assistant branch manager of the Oakland Omaha branch for the last year, previous to which time he was a branch manager for the John Deere Plow Co.

Hayes With Hess Spring—Lawrence Hayes has been appointed general superintendent and assistant plant manager of the Pontiac, Mich., plant of the Hess Spring & Axle Co., succeeding Frank Gimmelsman, who has been transferred to Cleveland to become plant manager. He was formerly factory superintendent of the Perfection Spring division of the Standard Parts Co., Cleveland, Ohio.

Universal Tire to Employ 500 at Start—The Universal Tire & Rubber Co., which recently acquired a site of 30 acres of land upon the ship channel at Houston, Tex., is having plans made for the buildings of its proposed manufacturing plant. It is stated that it will manufacture motor car tires and tubes and that it plans to make a specialty of export business. The initial unit of the plant will

give employment to about 500 men, and this will be increased to 1500 within a short time. The company is composed largely of Texas men.

Myers Leaves Jobbing for Colors—R. J. Myers of J. H. Haney & Co., jobber of motor car accessories, Hastings, Neb., has joined the colors and at present is located at Fort Riley.

Mason Tire Declares Dividend—The Mason Tire & Rubber Co. has declared a quarterly dividend of 1½ per cent of the preferred stock, payable July 1 to stockholders of record at the close of business June 15.

Eighty-four Per Cent Utility Cars There—The Mitchell Motors Co., Racine, Wis., reports that a canvass of the motor car situation in Australia indicates that 84 per cent of the motor cars in use there are in use as necessities. Salesmen, farmers and other classes use them in performing economic business functions.

Motor Truck Used as a Switch Engine—A U. S. motor truck, operated by the Benton Harbor Malleable Foundry Co., Benton Harbor, Mich., has for two years been pulling capacity loads with an expense of \$5 for repairs and the replacement of one tire, it is said. This truck is operated as a switch engine.

Aluminum Castings Makes Changes—W. T. Woodrow has been appointed general manager of the Manitowoc, Wis., plant of the Aluminum Castings Co. to succeed Howard Emery, who some time ago was promoted to the position of general manager of the plant at Detroit. Charles H. Seegitz, assistant manager at Manitowoc, Wis., has been transferred to the purchasing department at Cleveland and is succeeded by L. H. Gleason.

Huetter to Manage Premier Rubber—A. Huetter has been made vice-president and general manager of the Premier Rubber & Insulation Co., Dayton, Ohio, of which he is the founder. This is a new concern incorporated in Ohio for \$100,000. Mr. Huetter, who is an efficiency engineer, formerly was superintendent of the Boonton Rubber Mfg. Co. of Boonton, N. J., and for the last two years head of the Delco Bakelite department at Dayton, Ohio. The company has a plant which has been in operation since May 1

and its main products in the hard rubber line are battery jars and covers, distributors and other rubber insulations used on airplane and motor cars.

White Truck Calls the Roll—In reviewing the use of its truck in actual service the White Co., Cleveland, Ohio, finds that there are now 2153 White truck fleets in active service with a total enrollment of 23,226 trucks. This is exclusive of all single truck installations.

Havens to Manage King Service—C. E. Havens has been appointed service manager for the King Motor Car Co., Detroit, succeeding George C. Gurney, who recently resigned to accept a similar position with the Scripps-Booth Corp., Detroit. Mr. Havens was formerly service manager for the Hudson Motor Car Co. and later assistant general manager of the Bemb-Robinson Co., Detroit Hudson dealer.

Champion Holds Semi-Annual Sales Convention—The Champion Spark Plug Co., Toledo, Ohio, scheduled its semi-annual sales convention July 1-3 this year and called in its men from all parts of the United States and Canada. The first two days were spent in Toledo with luncheons, dinners, round table talks and general business sessions, and an indoor athletic meet was on the program. The last day was given over to a trip through the porcelain plant in Detroit.

Jobber Establishes School for Employees—The Northwestern Auto Supply Co., Billings, Mont., jobber in motor car accessories, has established a school for its employees, the purpose of which is to develop all possible ability among its woman workers. C. H. Moore, general superintendent and an expert mechanic, will be in charge. The school will be held at night and there will be actual demonstrations for the benefit of the employees. Similar schools may be held in Great Falls and Pocatello later.

Dart Truck Company Reincorporates—The Dart Motor Truck Co., Waterloo, Iowa, has reincorporated as the Dart Truck & Tractor Corp., with its former staff of officers unchanged. It will continue to manufacture its present line of heavy-duty, worm-drive trucks in the 1, 2 and 3½-ton sizes, and also has developed a new farm tractor to be desig-

nated as the Dart Blue J tractor. An addition has been added to the factory 250 ft. long, which will give a possible 100 per cent increase in facilities. Business during the first six months of this year is over 200 per cent of any six months in its history.

Hohenthal with Eisemann Magneto—E. H. Hohenthal, formerly sales and advertising manager of the Simms Magneto Co., has been made manager of the sales and service branch of the Eisemann Magneto Co., Detroit, and took charge July 1.

Cooper with St. Louis Chevrolet—L. K. Cooper has been appointed sales manager of the Chevrolet Motor Co. of St. Louis with headquarters at the St. Louis plant. He has been assistant to the sales manager of the Chevrolet Motor Co. of New York.

Henderson Heads Signal Truck—F. W. Henderson has been elected president of the Signal Motor Truck Co., Detroit, to succeed A. C. Burch, who resigned to become vice-president of sales and a director of the Clyde Cars Corp., Clyde, Ohio.

Kol-Ben Wheel Makes Appointments—Glover Watson, formerly a Michigan distributor for the Minute wheel, has been appointed southern sales manager for the Kol-Ben Wheel Co., Detroit, which is launching an aggressive sales campaign among jobbers and dealers. George H. Buck has been appointed eastern sales manager.

Indianapolis Trade Association Has Ninety Members—The Indianapolis Automobile Trade Association, Indianapolis, Ind., now has ninety members and is opening up permanent offices. The body is taking an active part in helping in the various Government activities as well as in local movement toward winning the war. Cars for the transportation of every Liberty Bond speaker and trucks for the hauling of pianos, musicians and chairs for hundreds of factory meetings were furnished to the Liberty Bond committee by them and 250 cars were furnished during the week of the War Chest drive. In addition the association subscribed for more than \$150,000 worth of bonds, bought \$5,000 worth of bonds for itself and contributed three full pages in the local papers to push the sale of the bonds. All the members went 100 per cent in the war chest subscription and about 40 per cent now are over the top in the thrift stamp campaign. The association puts on two shows

each year, a fall show and a spring show, and this year the fall show will be given with the annual state fair, Sept. 2-7. Three big tents will be used. John Orman is manager. The officers are: President, E. W. Steinhart; vice-president, R. V. Law; treasurer, A. H. Smith; secretary, A. W. Hutchinson.

Holm Heads Troy Trailer Sales—Orville D. Holm, who has been connected for some time with the Troy Wagon Works Co., Troy, Ohio, has been made manager of the Troy Trailer Sales Co., Detroit distributor.

Winningham Resigns from Hudson—C. C. Winningham has resigned as advertising manager of the Hudson Motor Car Co., Detroit, but retains his interests. He has not announced his future plans. It is said that no successor will be appointed during the war.

Fletcher Carbureters for American—L. V. Fletcher & Co., New York, have contracted with the American Commercial Car Co., Detroit, to use Fletcher carbureters as standard equipment on their trucks and delivery cars. The American is under production with a 1½-ton model called the Wolverine truck

and a ¾-ton model called the American delivery.

Lapeer Tractor-Truck Plant Complete—The new plant of the Lapeer Tractor-Truck Co., Lapeer, Mich., was completed last week. It is a two-story structure, 60 by 200 ft. Machinery is being delivered and the plant is expected to be completely equipped within the next two weeks. The capital stock of the company is \$100,000. The officers are: President, W. H. Tucker; vice-president, C. W. Smith; secretary, E. E. Mix; treasurer, R. T. Carpenter.

Menominee Stages 1200-Mile Drive—The Menominee Motor Truck Co., Menominee, Mich., sent seven trucks over the road last week to a seaport in Maryland, the driveway being about 1200 miles. The seven trucks consist of three 1-ton, three 2-ton and one 2½-ton trucks. Each of the 2-ton trucks carries one of the 1-ton trucks, while the 2½-tonner carries the bodies of the 1-ton trucks. It will probably take from twelve to fourteen days to get to destination. Under favorable weather conditions the trucks will travel about 100 miles a day.

CUTTING AND FITTING GASKETS

(Concluded from page 43)

material is very strong and closely woven so that when drawn up tight and shellacked on one side, it makes a very strong joint. In cutting a gasket of this material, lay it on the part where it is to go and hammer it slightly with a rawhide mallet or lead hammer. Upon removing the cloth, leave the dents on the under side and an exact reproduction of the part it is to fit can be cut out with a sharp knife.

GUM AND FABRIC RACK

Here is a gum and fabric rack which vulcanizers are finding convenient and practicable. It keeps the repair stock clean and permits several men to work at the same table without interfering with each other. It is a wooden frame, made to hold several rolls of gum and fabric, revolving on a stand fastened to the table. It can be turned in any direction to accommodate workmen at the opposite ends of the table.

The frame is 2 by 4 lumber, with holes bored through the sides to hold the rolls. The rack revolves on a piece of ½-in. pipe, threaded on one end to fit a wide collar, screwed to the center of the table. On the bottom of the rack is screwed a piece of 2-in. flat iron, into which a hole a trifle larger than the pipe support is bored. This hole extends into the wood 1 in. to act as a recess for the pipe support and increases its rigidity. Then another collar is screwed to the iron to hold the pipe.

On the end uprights of the rack may be hung knives, rollers, stitchers, scissors, etc., thus keeping the table clear of tools and allowing more table space for the repair. The entire contrivance is so simple that any vulcanizer can construct one very easily. This type of rack is used in the Goodyear School of Tire Repairing, Akron, Ohio, and is recommended to all tire repairmen.



TRUCKS EN ROUTE TO SEABOARD AND FRANCE—Both cars and trucks are moving from Detroit to the eastern seaboard in a steady stream. Here are fifty Dodge Brothers trucks ready for delivery to the Quartermaster Corps

From the Four Winds



RACING STILL DRAWS LARGE CROWDS—That racing is by no means dead in these busy wartimes has been proved by the crowds which have attended those events on this year's card. Just a section of the crowd at Chicago along the back stretch

ILLINOIS Licenses Show Big Increase—On June 7 motor car licenses for Illinois reached 340,000, the high-water mark for 1917. Last year 60,000 licenses were issued after July 1. Licenses are being issued now at the rate of about 1000 a day.

Chicago Motorists Hold Orphans' Day—The motorists furnished 500 cars June 25 for the annual orphans' day. In all 2500 persons were taken to Lincoln park for a day of pleasure, and so many cars were furnished that the old people's homes were visited and some of the inmates were taken to the park after all of the children had been cared for.

First Overland Car Delivery—What is said to be the first overland delivery of a motor car in this country is credited to 1899, when a Haynes phaeton was driven from Kokomo, Ind., to Brooklyn, N. Y., a distance of 1050 miles. The run was made by Elwood Haynes, now president of the Haynes Automobile Co. The car was built specially for Dr. Ashley A. Webber of Brooklyn and was designed to replace three horses. The overland drive was in the nature of a test; the general average running time was about 14 m.p.h. and the highest speed reached was 20 m.p.h. Near Schenectady, N. Y., Mr. Haynes had to wait several days while a pneumatic tire was made.

New Highway Is Organized—A movement begun by the chamber of commerce of Corsicana, Tex., has caused the organization of a Denver division of the Henry Exall highway, the purpose of which is to encourage the use of the Henry Exall highway as a route of travel from Colorado to the Gulf of Mexico. The movement started officially in May, when upon the invitation of the chamber of commerce of Corsicana, each town along the proposed route sent representatives to a meeting at Corsicana and elected officers. The officers of the organization are: John W. Carpenter, Corsicana, president; J. S. Sherrod, Thornton; Lowry Martin, Corsicana; W. M. Mincey, Waxahachie; Judge J. H. Sharp, Ennis, and W. W. Barnett, Mexia, vice-presidents, and C. N. Olsen, Corsicana, secretary-treasurer. The advocates of this route claim that it now has more miles of hard surfaced road than any other route to the Gulf. The length is 1115 miles. The organization is printing 10,000 log books, which will give a complete log of the route and a map. In addition the entire highway will be

marked with metal arrows bearing the legend "To Denver" and "To the Gulf."

Liberty Speeds Up Red Cross—The same two-passenger Liberty roadster that took part in the sale of bonds during the recent Liberty loan campaign in New York is aiding the Red Cross in its campaign for funds. The car originally was selected and purchased by the Rainbow Division of the Automobile and Allied Trades and donated to the Liberty Loan committee to be given with the largest purchase of Liberty bonds at any one of five New York theaters. The car was won by Kreeger Brothers, merchants, whose \$35,000 bond purchase was the largest purchase recorded. This firm presented the car again to a local committee for use in behalf of the Red Cross, and \$25,000 tickets at \$1 each were sold throughout the city.

Beam-Fletcher Transportation Organized—The Beam-Fletcher Transportation Co., Philadelphia, Pa., to operate long-haul, short-haul and local motor truck delivery in and out of Philadelphia, has been organized. The company is incorporated for \$500,000. It will operate a fleet of motor trucks to cities within a radius of 100 miles of Philadelphia and already has started operation between that city and New York, Baltimore, Reading, Easton, Allentown and Bethlehem. Extensions of the service include Lancaster and Harrisburg, Trenton and other nearby centers. The company now owns sixty-seven motor trucks, twenty of which are vans and twenty of which are open trucks, used for local freight. The company is handling 200 tons of freight a day. Officers of the com-

pany include P. E. Beam, president, E. C. B. Fletcher, vice-president, and C. A. Bothell, secretary-treasurer.

Philadelphia Has Truck Owners' Association—The Motor Truck Owners' Association of Philadelphia was formed to systematize motor trucking and stabilize freight rates. The officers are: President, William Arrott; vice-president, H. W. Dale; treasurer, George I. Oberholtzer; secretary, G. C. Dale.

Five-Ton Truck Moves Four Big Guns—A standard Garford 5-ton truck recently moved four 28-ft. guns, weighing 10 lb. each, a distance of 7 miles over winding roads. The haul was made from the beach in sand varying from 3 to 9 in. in depth and took 5 hr. The removal of the guns formerly required four days, but this method occupied only two days.

Twenty-four Passenger Cars in Suburban Service—The Henderson-Asheville Suburban Co. has twenty-four Reo passenger cars in service. The experiment was made for the first time last year and has proved a success throughout. The company has had two of the larger cars and several smaller ones in operation for a month or more. An inter-urban passenger service between Hendersonville and Chimney Rock and Bat Cove and between Hendersonville and Asheville is expected. The cars make three trips daily between Hendersonville and Asheville, N. C. Other cars are added to the twenty-four as needed. This service was adopted as an alternative to the street car service. The line connects with other motor lines.

School Abandons Flying Field—The National Training School, Detroit, has moved its airplane and motor car departments to new quarters. The airplane department has abandoned its idea of acquiring a tract of land for flying purposes, having been stopped by the Government from making this move owing to the fact that the proposed purchase of land is too close to the Government flying field. Steps are being taken to establish a flying field near St. Louis. The school has raised the price of its ground course from \$50 to \$65. A class of thirty-five students was graduated June 1. The majority of the men joined the Royal Flying Corps; others went into the American corps and a few became employees of the Packard and Fisher Body companies.

Coming Motor Events

SHOWS

July 13—Auburn, N. Y.
July 27—Syracuse, N. Y.
Sept. 2-7—Indianapolis, Ind.
Oct. 14-27—Dallas, Tex.
Oct. 28-Nov. 2—Chicago.

ROSS GEARS

THE steering gear is the only part of a motor truck constantly in use in which human strength is concerned.

No matter how perfect mechanically the truck may be in every other respect, if the steering gear is hard to operate, neither driver nor truck can do justice to the work they have to do. On the other hand, a steering gear that is easy to operate conserves the driver's strength and increases the efficiency of both driver and truck.

The man who drives a Ross-steered truck knows by experience that the enormous bearing surfaces in Ross Steering Gears, together with Ross quality in

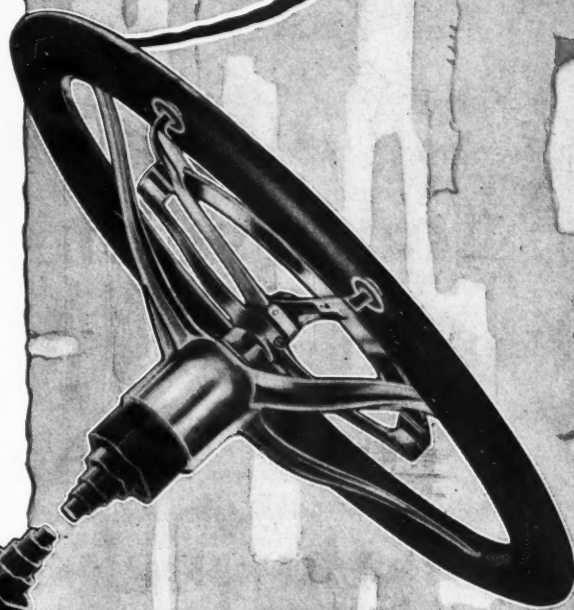
materials and workmanship, guarantee easy operation, as well as safety and reliability.

Ross Steering Gears mean an easier day's work for the driver, and at the same time a bigger return to his employer in greater service from both the man and the truck he drives.

As a result, Ross Steering Gears are now used as standard equipment by 115 different manufacturers, representing considerably over half the motor truck industry of the entire United States.

Write for catalog and any special information desired.

ROSS GEAR & TOOL CO.
400 Heath Street
Lafayette, Indiana



The Steering Gears that Predominate on Motor Trucks

When Writing to Advertisers, Please Mention Motor Age

JOHNSON CARBURETOR

Unsurpassed
for liveliness
and instant-
aneous response
on the pick-up.

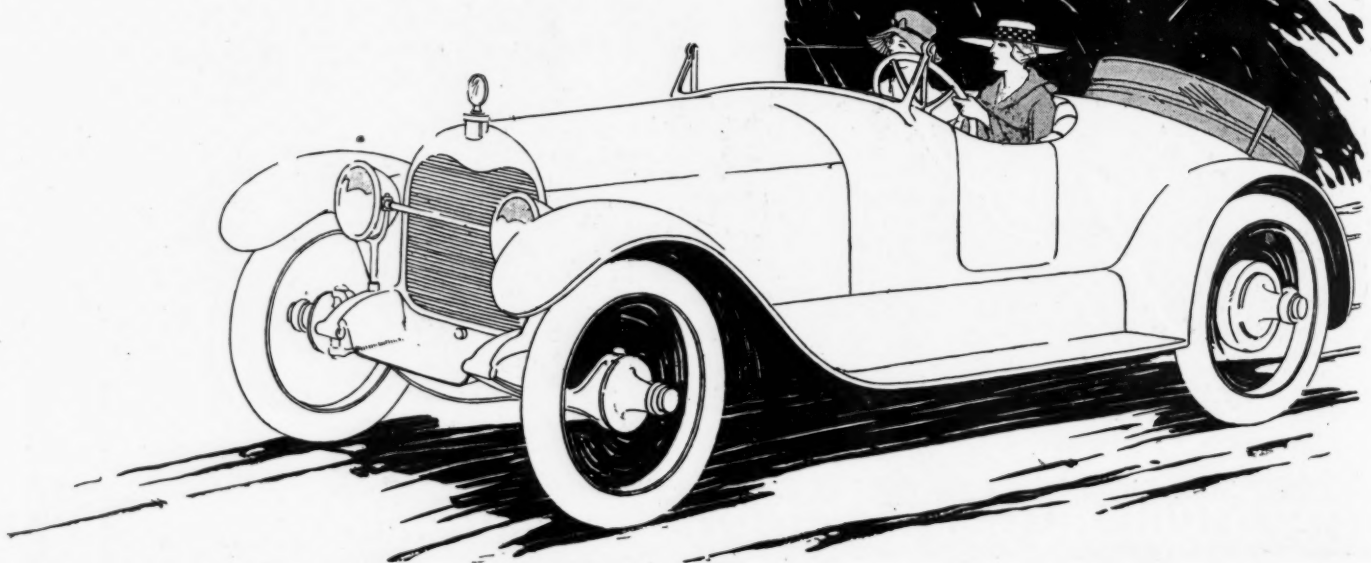
BUSINESS SOLICITED FROM
MANUFACTURERS ONLY

JOHNSON COMPANY

Makers of Superfine Instruments of Carburetion

DETROIT

MICHIGAN



When Writing to Advertisers, Please Mention Motor Age

STEPHENS

Salient Six

Instant Responsiveness

AS instant in its responsiveness to the driver as the polo pony is to its rider. At a touch of the accelerator the Stephens Salient Six leaps forward with ramming power or its speed increases gently at the will of the driver. An emergency push on its brakes brings it to a sudden stop, or light pressure on the pedal reduces its speed with gliding smoothness.

Such flexibility is possible only in a car with the scientific engineering balance of the Stephens Salient Six, possessor of the perfected over-head valve engine which burns ALL the gasoline.

5 Models

- Three-Passenger Roadster
- Four-Passenger Touring
- Five-Passenger Touring
- Five-Passenger Victoria
- Five-Passenger Touring Sedan

Stephens Motor Branch
of Moline Plow Co., *Moline, Illinois*

Factory: Freeport, Illinois





Beat the Car Shortage by Selling Anchor Tops

New-Found Profits for Dealers — Write Today!

HERE is a real life-saver for the dealer who cannot get enough cars from the factories and wants an additional line to take up the slack in his business. More than that, it's a big paying proposition for any dealer no matter how prosperous he is. Any man with a grain of vital ambition wants to expand, and the Anchor Tops offer the biggest opportunity of anything in the equipment field. Thousands sold last year and demand this season is double.

For Buick, Oldsmobile, Overland, Oakland, Dodge, Ford

These coach-built Anchor Tops—sedan or coupe—transform an open car into a fine closed motor coach, snug, luxurious and beautiful. They are built by men who received their training in producing fine coach work.

The charming lines reveal rare talent. Glass-enclosed with ventilating windows. Interior beautifully lined with attractive whipcord—nothing more serviceable. Hand-some dome light adds real elegance.

Our way of building Anchor Tops prevents squeaking, rattling and overhanging.

They fit on regular body irons perfectly. Easily installed without expert training.

Rush Shipments Ready

Most Buick, Oldsmobile, Overland, Dodge, Ford and Oakland owners are prospects. Tops sell on sight. Everybody wants them but few can get them if they wait too long.

Write at once—while freight shipping is open. Only prompt action will insure your getting an allotment before our output is contracted.

Use the coupon for prices, photo-designs and liberal discounts

The Anchor Top & Body Co., 732A South St., Cincinnati, O.

Fine Coach Builders for 30 Years

(26)

Dealer's
Confidential
Coupon

THE ANCHOR
TOP & BODY CO
732A South Street
Cincinnati, Ohio

Send photo designs, prices,
discounts and co-operative sales
offer on Anchor Tops.

Cars we handle.....

Dealer's Name.....

Address.....

.....

.....

.....

.....

.....

.....

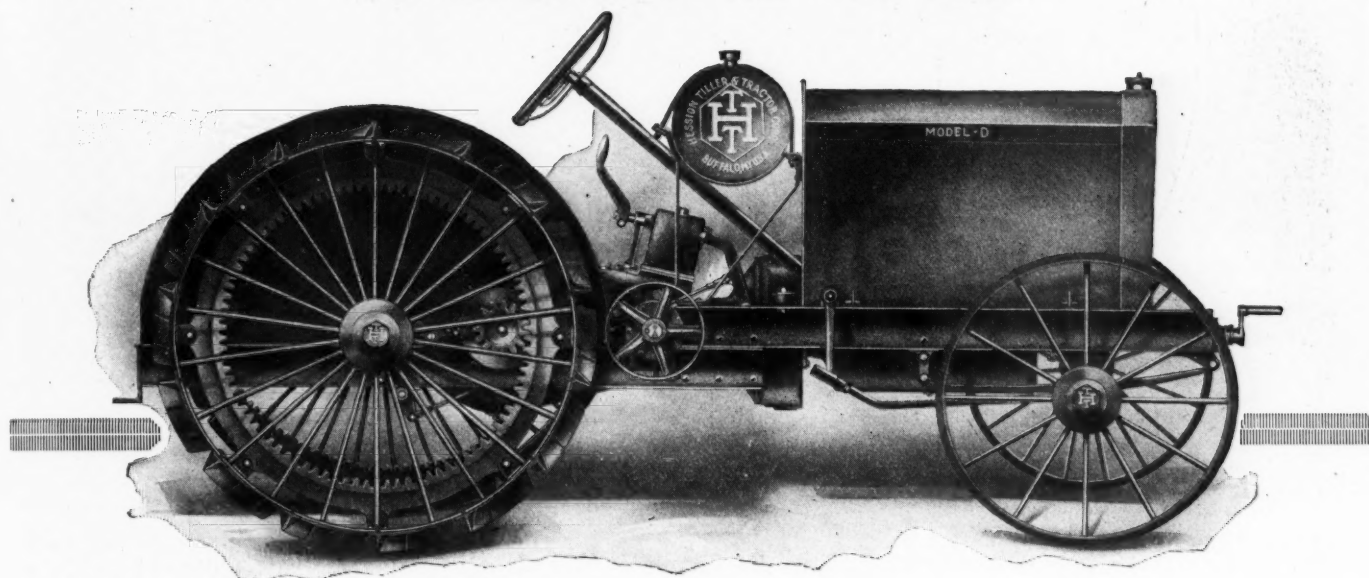
.....

.....

Hession

FARM *and* ROAD

TRACTOR



For All the Mechanical Work on the Farm

The development of a new and broader field of usefulness for the farm tractor is the natural consequence of its proven value in land work. Here was mechanical energy that need not be confined to the tilling of soil, if a way could be discovered to apply it to the many other needs of the farm.

In the HESSION Tractor the complete power plant for all purposes on the farm and on the road has been found. It is at once a land tractor, a road tractor, and stationary engine (for

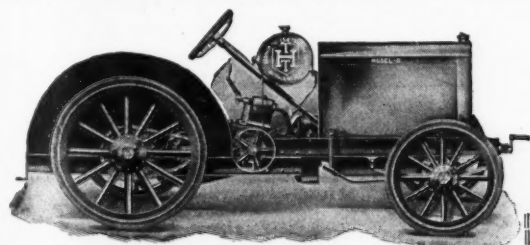
operating pumps and other machinery). By means of interchangeable road wheels, with solid rubber tires, it will haul heavily loaded trailers to and from market—any distance—at a speed of 10 miles an hour.

Mechanically the HESSION Tractor gives ample evidence of the matured thought and engineering talent that went into its designing—for it is an assembly of truly exceptional quality. Only the very finest units are employed in its construction. It has Hyatt and

Timken bearings throughout.

Because of its wide range of utility the HESSION Tractor possesses a well merited sales appeal that gives HESSION dealers an unmistakable advantage. In this, as in its unchallenged mechanical supremacy, it attains a position of leadership which assures a wide distribution throughout the entire farming area of the United States and Canada.

Write us regarding a HESSION agency in your territory.



HESSION TILLER & TRACTOR CORPORATION

27 Jewett Avenue

BUFFALO, N. Y.



Ever-Tyte

THE
PISTON RING
THAT STOPS 90% OF
MOTOR TROUBLES

Every Day in Every Man's Town

Garage man: - - "What's the trouble?"

Motorist: - - "Motor missing—no power—spark plugs full of oil."

Garage man: - - "You need new piston rings. They'll stop the oil from fouling your spark plugs, and give much greater compression. Save you gas and oil, too."

Motorist: - - "What kind of rings would you suggest?"

Garage man: - - "I recommend the Ever-Tyte Piston Ring to all my customers. It's the only piston ring that's really practical. It gives you real power and certainly puts an end to gas and oil wastage. You can't go wrong on Ever-Tyte, because it's guaranteed to give satisfaction or money refunded."

Ask any engineer about Ever-Tyte's 3-Point Radial Expansion.

The EVER TIGHT PISTON RING Co.
1604 Kingsland Ave. :: :: :: Saint Louis, Mo.

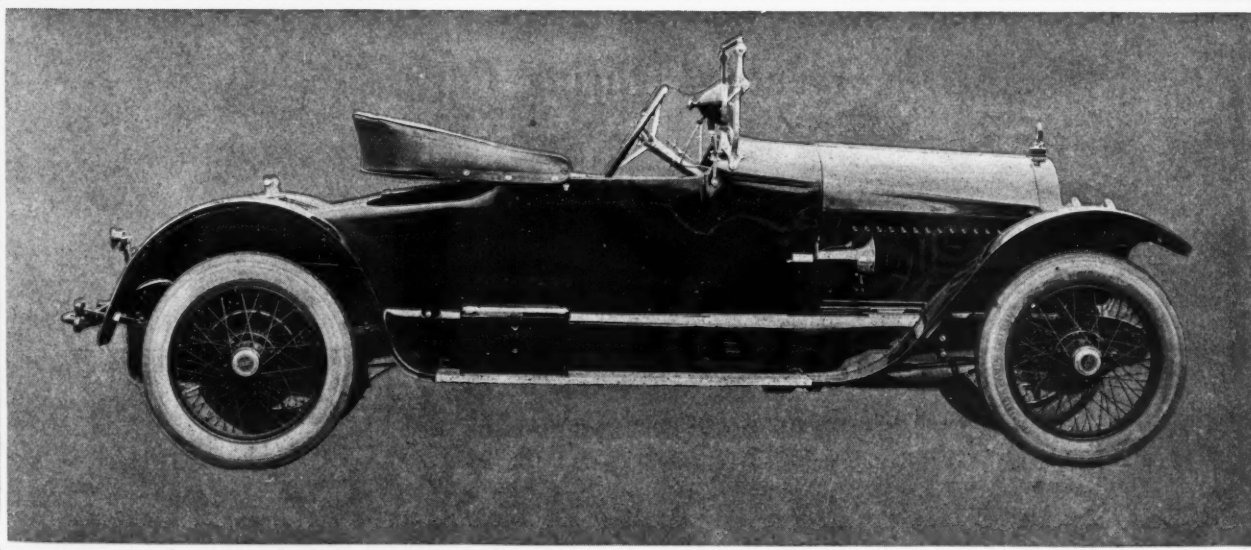
FREE "The Piston Ring Primer"—full of interesting and valuable piston ring information that every Car Owner and Garage man should have. Write for your copy today.

**TIME TESTED—
SIX YEARS!**



National Ad. No. 116

819



When Writing to Advertisers, Please Mention Motor Age

*Start the Profits
moving Once more*

The immediate profit on Lalley-Light, inviting as it is, is not so interesting as the possibilities for a permanent business.

The farm market is ready and eager for electricity. It is just opening up. Lalley-Light is a product of seven years' standing.

Your motor car market also is eager for cars. But you cannot take full advantage of the situation.

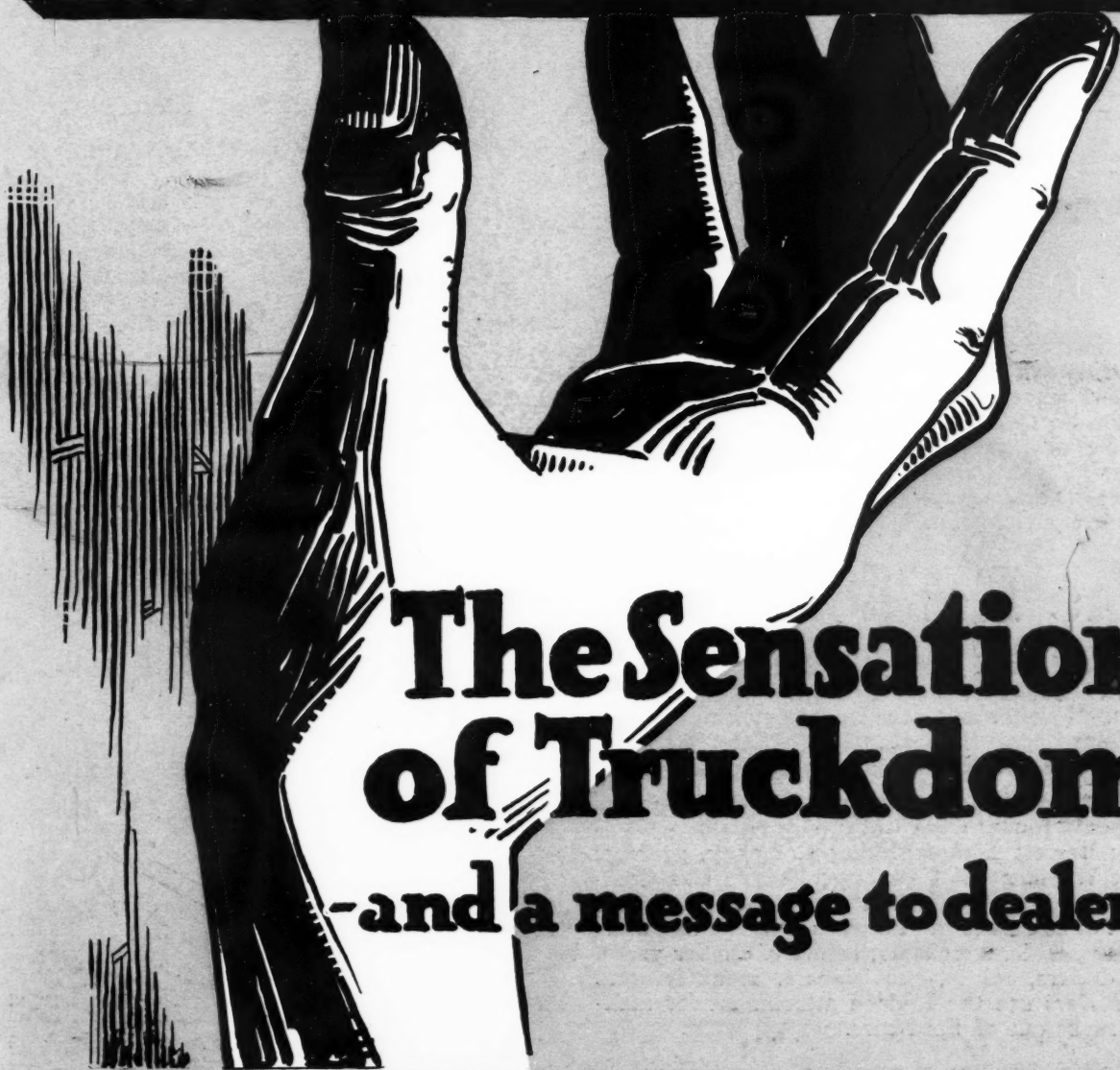
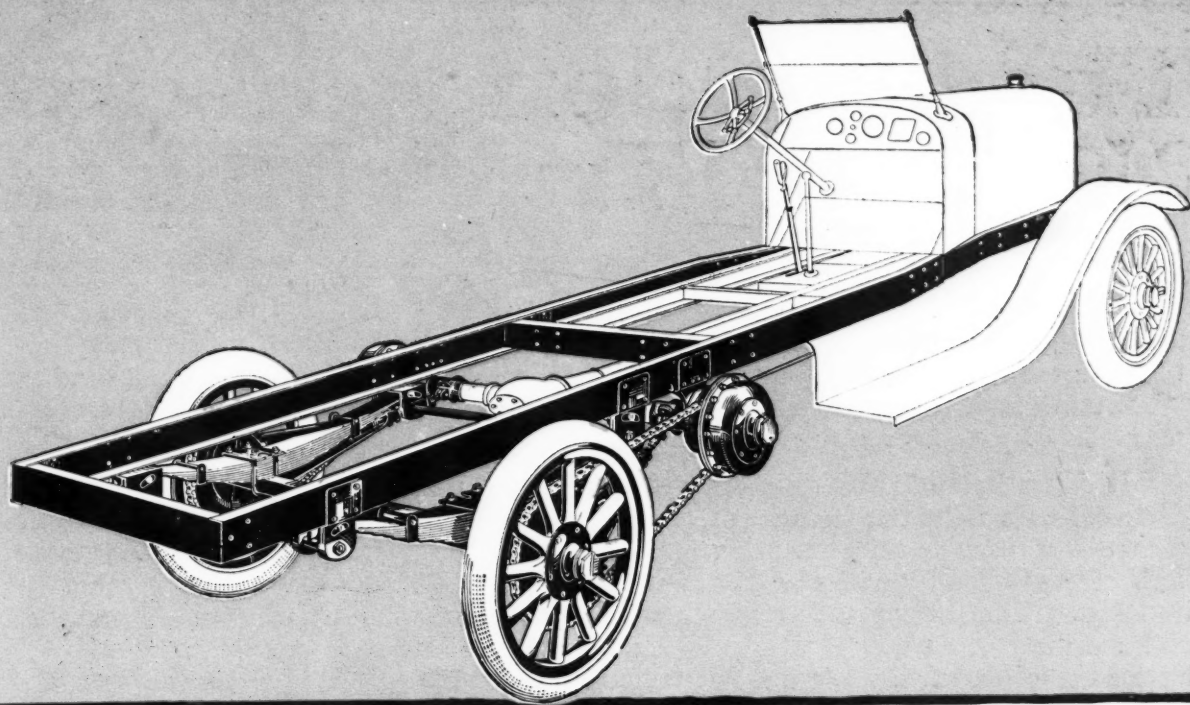
The opposite is true of Lalley-Light. The present time is your richest opportunity.

These are the barest facts. Write at once or wire for details.

Lalley Electro-Lighting Corporation
1821 Mt. Elliott Avenue Detroit, Michigan

LALLEY-LIGHT

"Always runs and runs right"



The Sensation of Truckdom

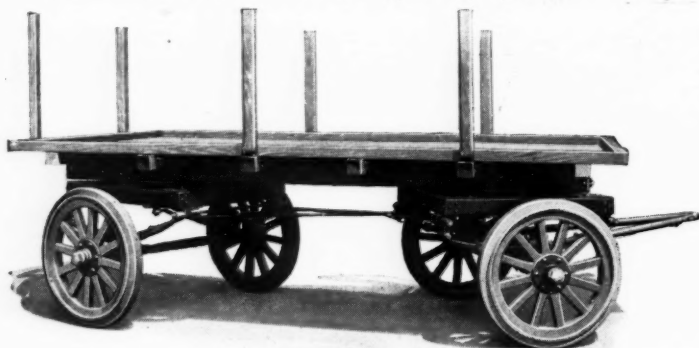
-and a message to dealers

The Redden *Perfected* Universal Truck Maker

Makes a truck of any make or model car

NOW, after a year's engineering work, we announce the Redden *Perfected* Universal Truck Maker (shown on page 1), which is 100% better than any other truck maker on the market. It's the only truck maker that fits any make or *obsolete* model of passenger car, not excepting those with rear axle transmission.

It offers half off hauling costs and astonishingly low maintenance cost—half the *first* cost of a light truck. Attached in a third of the time of others in any barn or garage—no machine shop needed, no machinery, no labor expense, no delay. Any man with ordinary intelligence can attach it himself. Simply strip *any* passenger car of its body, cut the frame in two with a hack saw—have a cold chisel, wrench, hammer and a drill; join on this greatest of all war-time transportation developments and you have a complete, efficient, dependable truck.



The Redden Trailer Tracks Perfectly

Every man with a truck is a trailer sales prospect.

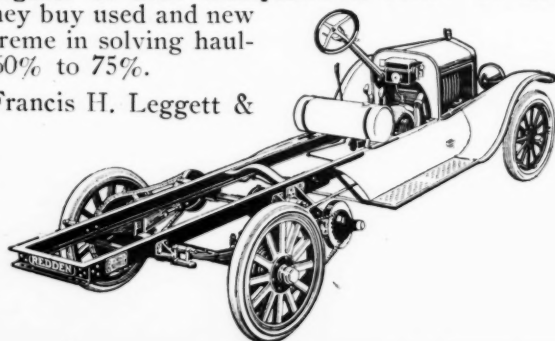
The Redden Trailer makes it possible to get nearly *double* the delivery value from a truck. Has exclusive and needed features. It reduces labor costs and saves time. To buy a new truck means employing another driver, be-

sides increasing delivery maintenance costs. Business with big hauling to do is finding it MORE profitable and quicker to have less trucks and more trailers. While several trailers are being loaded—others are on their way. While these are being unloaded at their destination, the trucks hitch on to unloaded trailers and come back for the trailers that are being loaded. Redden Trailers not only answer the labor shortage, but make possible dispensing with further labor as the Government exigencies arise, without confusion or hauling embarrassment; no loss of time loading other trucks, but a *continuous delivery system* at tremendously lower hauling cost. Different to any other trailer and best from every viewpoint.

The Redden Attachment for Fords

The demand for the Redden Ford Attachment is indisputable evidence of its matchless merits. Big business—men who have accurate *figures* of their transportation costs—do not buy trucks after using the Redden Attachment. They buy used and new Fords and convert them into trucks that stand supreme in solving hauling problems, and lowering transportation costs 60% to 75%.

For instance, Armour & Company, packers; Francis H. Leggett & Company, foods; Coca Cola; Ward Baking Company; Barrett Manufacturing Company, roofing; Great Western Oil Company; Detroit Gas Company—one great Canadian department store has a fleet of 28 Reddens. Farmers, transfer and storage businesses, merchants, teaming, lumber yards, coal dealers, mines, provisioners, manufacturers and dealers use the Redden attachment for making trucks out of Ford cars.



The Redden Complete Line MESSAGE^{TO} DEALERS

TRANSPORTATION is a vital national problem. It confronts the U. S. Government and private businesses. Business that increases its hauling efficiency not only makes big profit for itself, but overcomes labor shortage due to war's demands, and helps Uncle Sam in overcoming transportation problems. It's the patriotic duty of every business with hauling to do to reduce hauling costs by improving hauling methods. The Redden Line comes to the aid of the individual business with hauling problems at a time when most needed.

The demand for the Redden Line is everywhere. Tradesmen, butchers, bakers, grocers, milkmen, big stores, small stores, manufacturers, factories, foundries. There is the Farmer—a market for the Redden Line that's staggering in its possibilities. The demand for food calls for quick transportation to market. The Government wants the farmer to keep his horses on the farm; they are needed there by Uncle Sam's food program. In other words, the Government advises the farmer to motorize his delivery. He can transport his products quicker, better, cheaper, and make MORE money with the trucks. The Redden Line more than compensates for his loss of horse and man power—and makes more profit for him.

For men who have trucks the Redden Trailer makes it possible to do MORE hauling at lower cost and without having to buy more trucks. It helps

Uncle Sam because it not only reduces hauling costs 50% or more, but eliminates labor, saves time, and conserves freight car space. It means that truck factories can serve Uncle Sam with trucks or other wartime necessities.

For the man with a Ford Car the Redden Ford Attachment makes the most efficient truck at the price on the market. Not another one like it—staunch, sturdy, capable of enduring severe and continuous service. Easily and quickly fitted, light weight, dependable and lasts a life time.

For the man who has an old car (any Make or Model), any type of axle—semi-floating, three-quarter floating, seven-eighths floating, or full floating—the Redden Perfected Universal Truck Maker fits perfectly without alteration. It's *perfected*—can't be improved for adaptability, and is unexcelled in simplicity, efficiency, durability.

The Redden Perfected Universal Truck Maker

Three-fourths of the truck is in your town or district in the form of a used passenger car of any make or obsolete model. Patriotism urges you to save freight car space. Here is the *perfected* attachment that not only makes of any passenger car as good a truck, or better, than most trucks of similar capacity, but conserves freight car space. About 8 *perfected* attachments take the same freight car space as a built truck! This also saves freight costs!

When attached, the appearance of the truck is that of a regular commercial auto car.

Used Car Dealers and Garages

If you have any used or obsolete model cars of any make, convert them into dependable, strong, delivery-cost-cutting trucks, by attaching this easily and quickly fitted and efficient *Perfected* Universal Truck Maker. You'll make money easily and quickly out of what is now your dead stock.

It has extra service brakes on the jack shaft. You do not have to cut up the used car. The chain can't jump off. It is *Perfected* for service and economy.

SPECIFICATIONS

Carrying Capacity—3,000 pounds.
Frame—Heavy 4-inch pressed steel channel.
Axle—Solid bar, 2½ inches square, high carbon, heat-treated steel, with heavy-duty roller bearings.
Springs—Semi-elliptical, 2½ inches wide, 40 inches long, 8 leaves, with hardened steel bushings in ends.
Spring Seat—7 inches long.
Spring Shackles—Heavy, with large bearing surfaces, with lubrication well provided for.
Wheels—Heavy artillery type, S. A. E. Standard, 34x3½. Twelve 1½-inch square section spokes.
Tires—Solid rubber, 34x3½ inches.
Tread—Standard, 56 inches.
Gear Ratio—7½ to 1 (23 teeth on jack shaft, 49 teeth on rear). (Special) 6½ to 1 (28 teeth on jack shaft, 49 teeth on rear).
Drive—Roller chain, 1x½x¾ inch.
Brakes—Large emergency brakes with enclosed drums on rear wheels; also two extra service brakes on jack shaft.
Wheel Base—128 inches.
Loading Space—Nine or ten feet or more, depending on style of body.
Price—\$450.00 F. O. B. Factory.

The Redden Trailer

The delivery cost-cuts that the Redden Trailer effects are amazing. By a systematic use of these trailers, firms are doing with one truck and trailers what other firms are doing with a number of trucks and no trailers.

The Redden Trailer has features and advantages that make it the *preferred* trailer. For instance, others pull the load from the body—the Redden is pulled from the axle.

The Redden Trailer can be backed up, which is impossible to do with others.

Due to exclusive design, the Redden Trailer wheels track—the back wheels run in the same track as front wheels—a big advantage in turning corners.

The Redden Trailers are substantially built for roughest service. Many powerful selling features that will over-tower the best features of any other trailer. Supplied in one ton, two wheel type or two ton, four wheel type.

SPECIFICATIONS

Carrying Capacity—4,000 pounds.
Frame—Sub frame, heavy 4-inch pressed steel channel with three 4-inch cross members, double gusset plates. Main frame, heavy 4-inch pressed steel channel, six 4-inch cross members.
Axles—Solid bar 2½ inches square, high carbon, heat-treated steel with heavy-duty roller bearings.
Springs—Four in number. Semi-elliptical, 2½ inches wide, 40 inches long, 8 leaves with hardened steel bushing in ends.
Spring Seat—7 inches long.
Spring Shackles—Heavy, with large bearing surfaces and lubrication well provided for.
Wheels—Heavy artillery type, S. A. E. Standard, 34x3½ inches.
Tread—Standard, 56 inches.
Fifth Wheel—Both front and rear axle equipped with King bolt, 36 inches in diameter. Fifth wheel and rollers, front and rear axles interlocked so as to give same turning radius and track perfectly.
Coupling—Strong trailer coupling for attaching to truck or tractor, with hook on rear for attaching more trailers.
Price—(2-ton four-wheel type)—\$690.00 F. O. B. Factory.

The Redden Attachment for Ford Cars

Merely by stripping the body off any Ford car and attaching the Redden unit, as per simple instructions, a high-grade and dependable truck can be made quickly, easily and at an immense saving.

The converted Ford truck will do the work as well or better, as cheap or cheaper, as quick or quicker than any specially built truck on the market. You know the power, efficiency, dependability and economy of the Ford engine and construction—The Redden Attachment is in harmony with all these features.

Thousands have been in use in every part of the country—over all kinds of roads—under conditions that usually cripple an ordinary truck. Let the specifications speak for themselves.

SPECIFICATIONS

Carrying Capacity—3,000 pounds.
Frame—Heavy 4-inch pressed steel channel.
Axle—Solid bar, 2½ inches square, high carbon, heat-treated steel, with heavy-duty roller bearings.
Springs—Semi-elliptical, 2½ inches wide, 40 inches long, 8 leaves, with hardened steel bushings in ends.
Spring Seat—7 inches long.
Spring Shackles—Heavy, with large bearing surfaces, with lubrication well provided for.
Wheels—Heavy artillery type, S. A. E. Standard, 34x3½. Twelve 1½-inch square section spokes.
Tires—Solid rubber, 34x3½ inches.
Tread—Standard, 56 inches.
Gear Ratio—7½ to 1 (23 teeth on jack shaft, 49 teeth on rear). (Special) 6½ to 1 (28 teeth on jack shaft, 49 teeth on rear).
Drive—Roller chain, 1x½x¾ inch.
Brakes—Large emergency brakes with enclosed drums on rear wheels; also two extra service brakes on jack shaft.
Wheel Base—128 inches.
Loading Space—Nine or ten feet or more, depending on style of body.
Price—\$390.00 F. O. B. Factory.

Are you under allotment in passenger cars?

THE Redden Line provides a golden opportunity for you to make big money. *Every* man who has hauling to do is a prospect for either the Redden *Perfected* Universal Truck Maker or the Ford Attachment. *Every* man who has a truck and every man who needs another truck is a prospect for *trailers*.

Immediate Deliveries

WE are in a position to make immediate deliveries of the complete Redden Line—the Redden *Perfected* Universal Truck Maker, the Redden Trailer, the Redden Attachment for Fords. Some choice territories are open for responsible dealers. The Redden proposition is most attractive. Wire at once for fuller particulars, literature and terms.

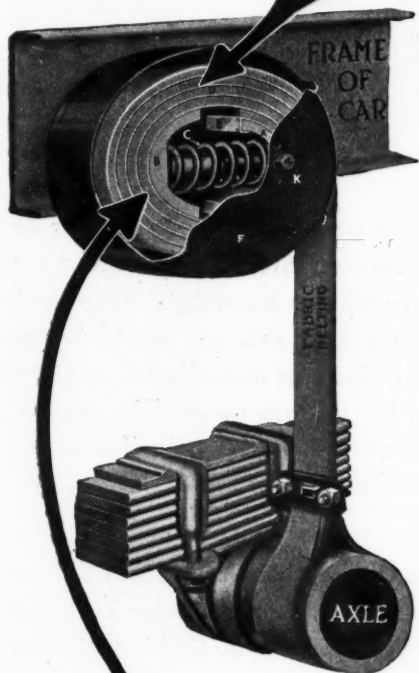
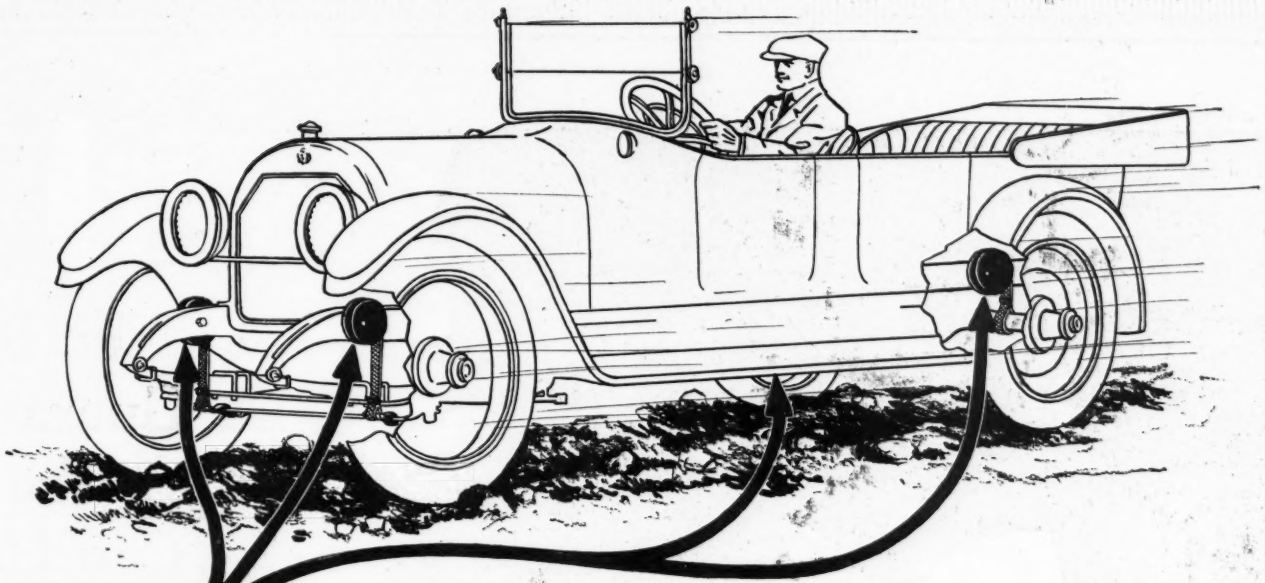
REDDEN MOTOR TRUCK COMPANY, Inc.

2337 South Michigan Avenue, Chicago, Illinois, U. S. A.

NEW YORK OFFICE
Redden Motor Truck Co., Inc.
224 West 57th Street
New York City

PACIFIC COAST
Redden Pacific Co.
1608 L. C. Smith Bldg.
Seattle, Wash.

WESTERN CANADA
Western Canada AutoTractor Co., Ltd.
315 Hammond Bldg.
Moose Jaw, Sask.



REDUCED EXPENSES—

for mechanical repair and up-keep, invariably follow the use of Snubbers, because Snubbers eliminate injurious bouncing, and keep the car riding smoothly on the ground.

GABRIEL SNUBBERS

\$18, \$24, \$30 Per Set of Four

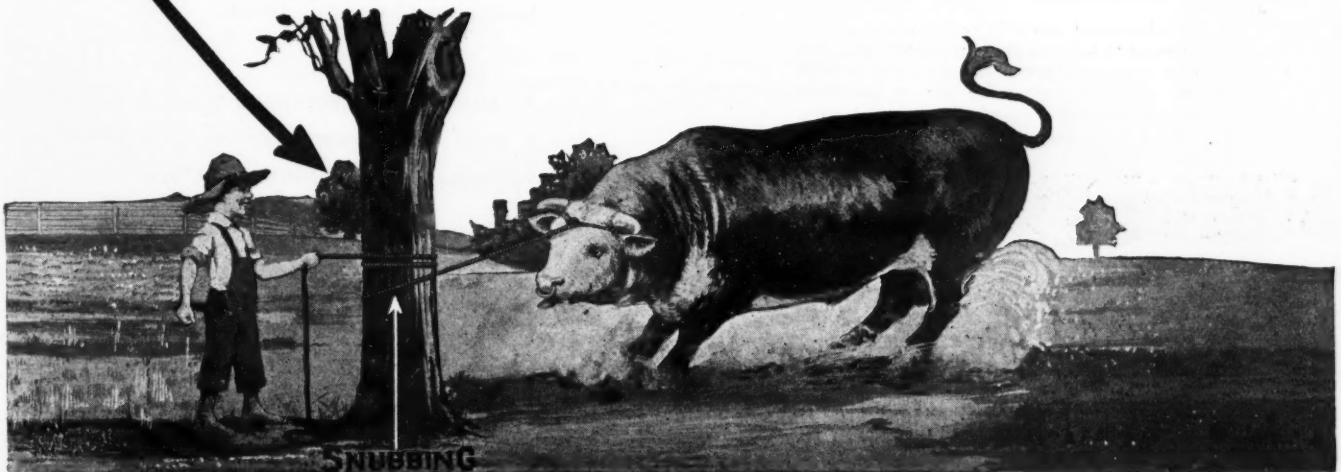
Ready for you to attach

Riding Comfort for passengers and Longer Life for the car are extra hundred-percent dividends on your investment in Snubbers.

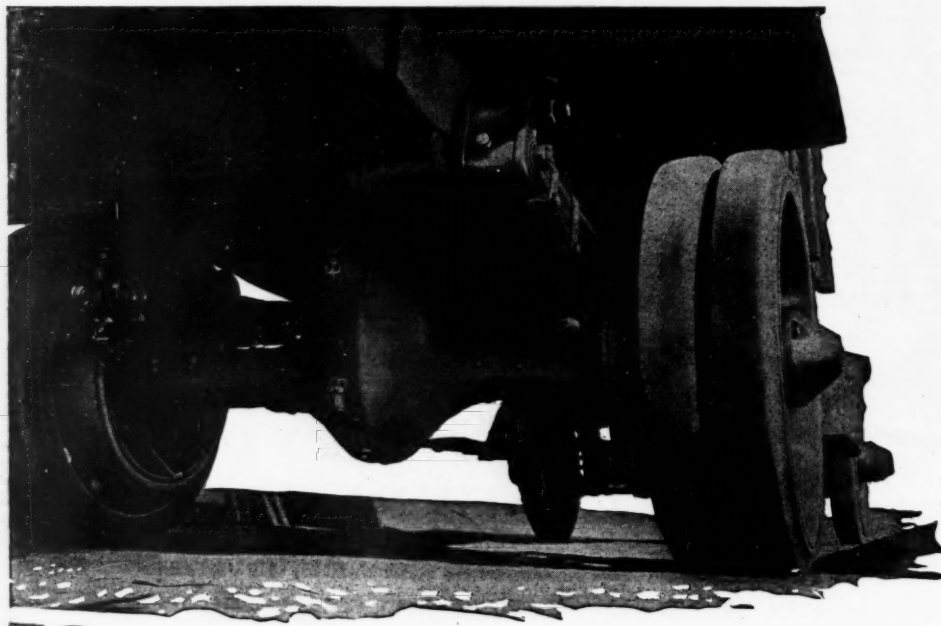
Standard factory equipment on the leading cars.

SEND FOR LITERATURE

GABRIEL MFG. COMPANY, 1415 E. 40th St., Cleveland, O.

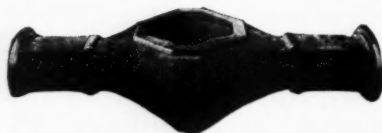


When Writing to Advertisers, Please Mention Motor Age



The Best Guarantee a Truck Can Have

THE ONE-PIECE HOUSING



Cast in one piece, the Sheldon Axle Housing has no "parts" to work loose when rough pavements are encountered or tires are worn to the base—a menace which is ever present in assembled housings.

It takes about two hundred thousand pounds pressure to bend this housing double—and even then it does not crack or split. Such strength can come only from the use of the finest quality materials and the most expert annealing.

SHELDON WORM DRIVE REAR AXLES

A truck with a Sheldon Worm Gear Rear Axle needs no other guarantee of quality. Any truck manufacturer who so knowingly discriminates in the selection of an axle will not be less particular in his choice of units for the rest of the assembly. *The manufacturer who builds a hastily constructed chassis, to sell at a price, cannot afford a Sheldon Axle.*

The Sheldon Axle is built to stand so much more abuse than it will ever receive, even under the most trying conditions, that it will master any stress that a truck can encounter, conquer any road, any hill and any load, without the least sign of wear or strain.

So any Sheldon equipped truck is bound to be a good truck—carrying its own warranty of value in its mechanical structure.

SHELDON AXLE & SPRING CO.



Makers of Springs and Axles for Heavy Duty Service for more than Fifty Years



WILKES-BARRE, PENNSYLVANIA



COMER

\$12.50

WHY Did the RAILROADS Adopt and Maintain the SEMAPHORE BLOCK SYSTEM?

Because it is the most practical means of conveying "a message of danger" and protection against loss of life and property.

The Semaphore speaks in all languages—it is positive—unmistakable.

The Comer Auto-Stop Signal is more positive than the Railroad Semaphore. It operates automatically, without the touch or thought of the driver. No push buttons. No levers. No switches. Not electrically operated.

How many thousands of bent, crumpled fenders—punctured gas tanks and dented bodies have you seen on the road? How many serious accidents, wrecked cars and loss of life, have you read about? Did you ever stop to consider how many of all of these were due to rear end collisions thru faulty or neglected signalling?

Equip your car with a Comer Auto-Stop Signal which requires no further thought after installation. It is REAL INSURANCE.

Can be installed in thirty minutes. No complicated mechanism. The slightest pressure on service (foot) brake operates signal.

Dealers will find it a ready "seller." Write for complete details.

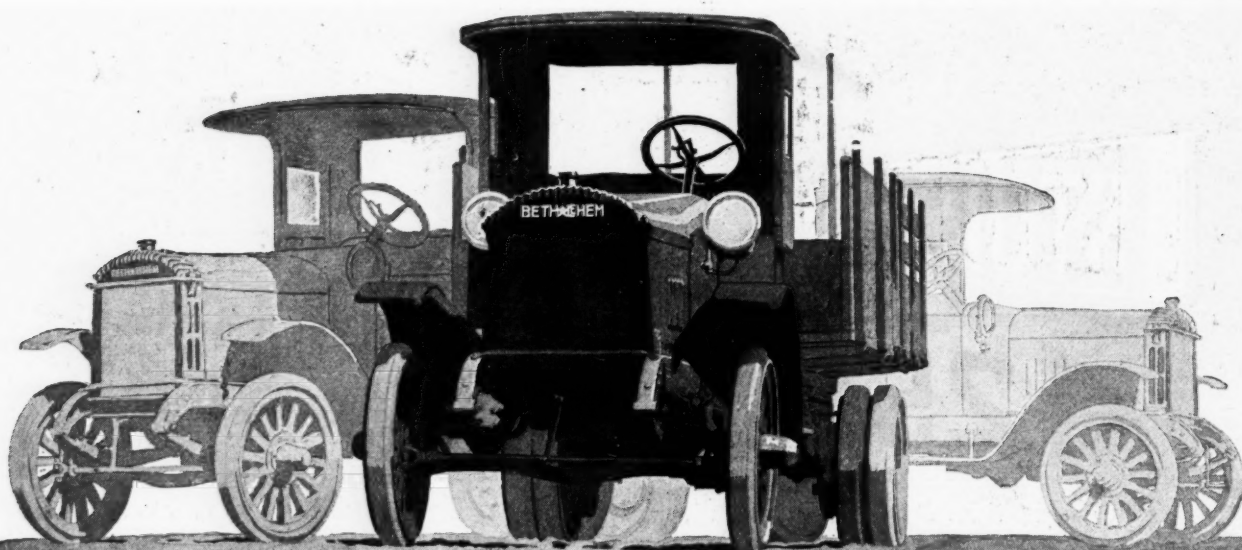
If your dealer does not carry the Comer—send \$12.50, giving us your dealer's name, and we will ship parcel post.



The Wonder Sales Co.

616-617 Hippodrome Bldg.
CLEVELAND OHIO





THE NEW BIG BETHLEHEM LINE

1 1/2 tons—

Designed and built by Bethlehem Engineers, according to the highest Bethlehem standards of advanced truck development. A Bethlehem designed and Bethlehem built Motor—Gray and Davis starting and lighting system—armored radiator—Internal Gear nickel steel rear axle—wheel-base, 136 inches. A perfect, dependable, one-and-one-half ton motor truck backed by the big Bethlehem organization. **Chassis Price \$1765**

2 1/2 tons—

A great motor truck that is years ahead of any competitor in modern truck design and manufacture. The powerful Bethlehem Motor—Gray and Davis starting and lighting—a Bethlehem Motor Truck that is perfectly balanced and designed for excess strain from end to end. It will carry your confidence at an extremely low cost. **Chassis Price \$2165**

3 1/2 tons—

The biggest Bethlehem built—big enough for any load and stronger than any road. 7000 lbs. capacity, Gray and Davis starting and lighting—162-inch wheel-base. The big Bethlehem 3 1/2 ton truck has more strength in every dimension than it will ever be required to use. It will take your loads off your mind. **Chassis Price \$3265**

(ALL PRICES F.O.B. ALLENTOWN, PA.)

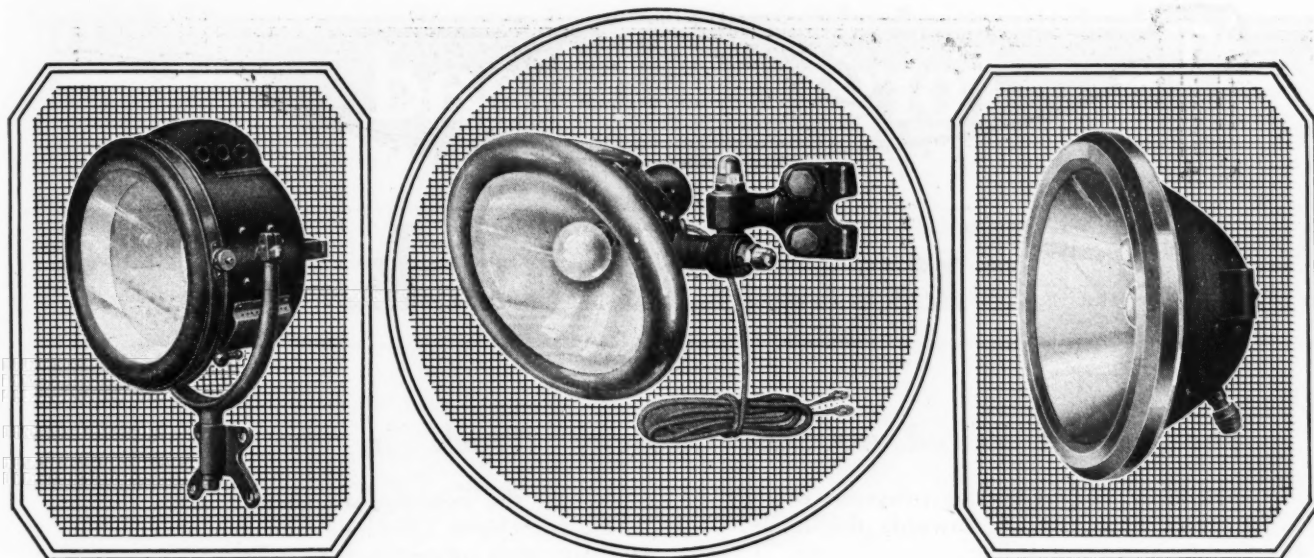
The new, big Bethlehem line is the owners' line, the drivers' line, and the dealers' line—Take everybody's advice and examine a wormless Bethlehem

The Motor Truck bought to-day without Electric Starting and Lighting will be out-of-date to-morrow

BETHLEHEM
Internal Gear Drive
MOTOR TRUCKS
Dependable Delivery

BETHLEHEM MOTORS' CORP'N. ALLENTOWN, PA.

The Motor Truck bought to-day without Electric Starting and Lighting will be out-of-date to-morrow



LIGHTING *the* ROADWAYS *of the* WORLD

ON the highways of the world—in the Americas, Europe, Asia, Africa—wherever motor cars are driven you will find Victor equipped motor cars.

Experience qualifies the Victor organization to build motor lamps which merit this world wide reputation for service and reliability.

For more than twenty years the name "Victor" has been universally accepted as representing the utmost in design, workmanship, economy and service.

The Victor organization has always been

the leader in the improvement of motor lamps. Most of the really effective changes in design and construction developed during the past twenty years have originated with the Victor organization.

The result of these years of tireless effort has been the demand of motorists in every part of the world for Victor lamps. The mark of the Victor organization represents to the motorist efficiency combined with refinement. Look for this mark on motor lamps.

THE CORCORAN-VICTOR COMPANY

716 Reading Street, Cincinnati, Ohio

Victor
TRADE MARK
LAMP
for

MOTOR CARS - MOTOR TRUCKS - TRACTORS - AEROPLANES

When Writing to Advertisers, Please Mention Motor Age



Traffic Truck

4,000 LBS. CAPACITY

\$1195

The Lowest Priced 4000-lb. Capacity Truck in the World

Nothing can stop the progress of the TRAFFIC TRUCK towards the leadership in the truck field.

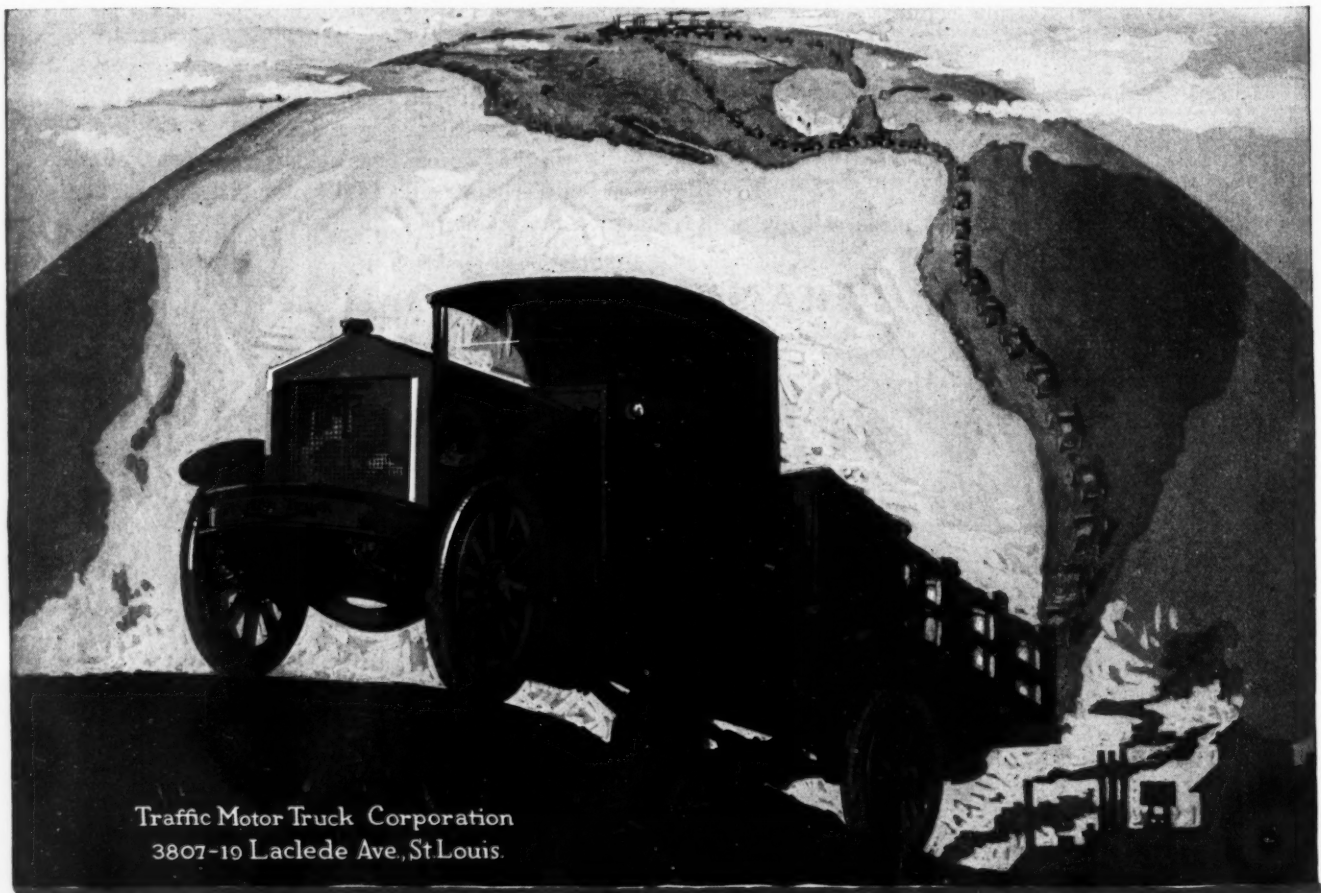
The universal demand for low-priced means of transportation is being met with Traffics. The Truck that fully answers 85 percent of all load requirements. Most economical to operate. Dependable in every part.

Dealers Must Act Quickly to Get Territory
The biggest, best and most experienced

dealers in the country are snapping up Traffic franchises. Nothing like this opportunity ever offered before. Don't let your competitor beat you to it. Our purpose is to complete our national distributing organization as rapidly as possible, and territory is going fast.

WIRE US to see if your territory is open—then come in to St. Louis—see the Traffic and look us and our plant over. You'll be as enthusiastic as we are.

Some Traffic Features: Prompt deliveries; Weight, 3,300 lbs.; Gray motor, 4-cylinder, valve-in-head; 35 h. p. Covert Transmission; multiple-disc clutch; Kingston magneto; Cellular type radiator; drop forged front axle with Timken roller bearings; Russell rear axle, internal gear, roller bearings; semi-elliptic, front and rear springs; 6-inch U-channel frame; standard Fish Tires; 133-inch wheelbase, 122-inch length of frame behind driver's seat; oil cup lubricating system, and many other features for perfect performance.



Traffic Motor Truck Corporation
3807-19 Laclede Ave., St. Louis.

When Writing to Advertisers, Please Mention Motor Age

What the authorities think about Conaphores

Experts on automobile headlighting, who have occasion to try out Conaphores, are constantly sending us interesting reports. Here's what a few of them say:

I believe Noviol Conaphores are the best thing on the market that I have seen to prevent headlight glare and at the same time give a good driving light.

CHAS. W. CHAPMAN,
Acting Head, Physics Dept.
Michigan Agricultural College.

I like Conaphores better than any other lenses I have tried. I will say that your Conaphores do eliminate the glare and I can see no reason why they should not be accepted by any state or city as meeting this requirement.

H. L. RAMSEY,
Deputy Commissioner
Commissioner of Motor Vehicles, Frankfort, Ky.

The principal objection I had to my diffusing lens was that for self-protection it was advisable to dim the lights in many cases. With Conaphores there is no occasion to do so, as I cannot see how it would be possible to dazzle the eyes of a driver of an approaching car.

T. S. GRUBBS,
Union Switch & Signal Company.

I have given Noviol Conaphores a good trial. I find that they throw the light well to the sides of the car as well as in front and do away with the objectionable glare of the ordinary headlight.

COLEMAN C. VAUGHAN,
Secretary of State, Mich.

Make inquiries yourself

Ask motorists in your own territory what they think of Conaphores. Their opinions, too, will be unanimous.

Our nation-wide advertising is putting the Conaphore story before every motorist in your territory. Users are constantly expressing their satisfaction to others. Let your customers know that you handle Conaphores and you are bound to do a profitable business.

My Conaphores were looked upon with favor by all who saw them, both by City officials, and members of the Motor Club. They were spoken of as the ideal light.

A. H. GUNTHER,
Secretary Chillicothe Automobile Club, Ohio.

The blinding glare caused by the use of most every other form of headlight glass is entirely overcome by the use of the Conaphore.

F. J. WALPOLE,
Pennsylvania Rubber Co.

I have had placed upon my automobile a set of your Conaphores. The glass works to perfection and if used on all machines will be the means of preventing many night accidents along dangerous highways.

JULIUS A. SCHMAHL,
Secretary of State,
Minnesota.

My Noviol Conaphores have been in service for a couple of weeks and I have enjoyed my night driving to a much greater extent than ever before as Conaphores certainly give a wonderful light.

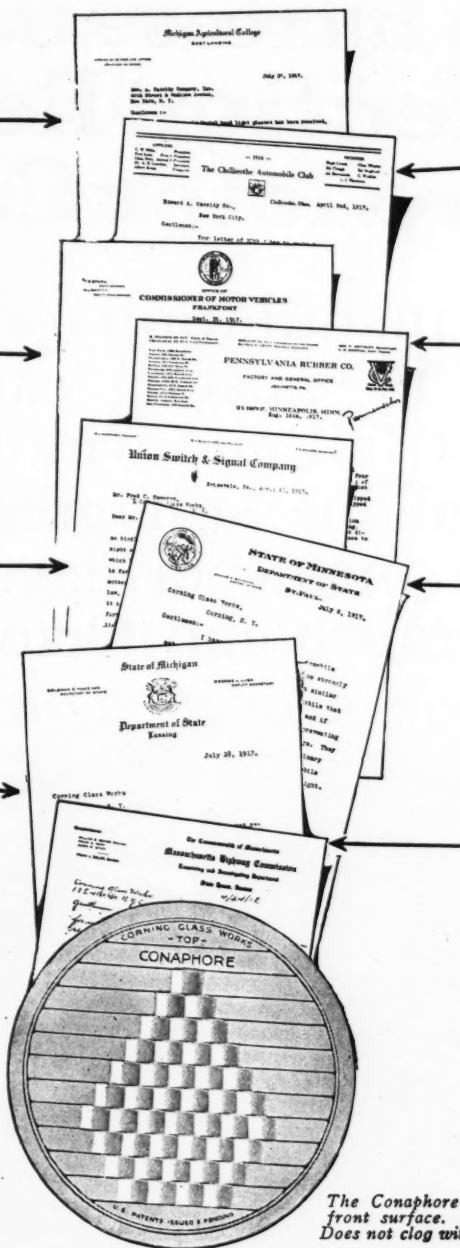
E. L. BLISH,
Massachusetts Highway Commissioner.

Retail Price List (per pair)		Noviol Glass	Clear Glass
5 to 6 1/2 inches incl.	...	\$2.40	\$1.60
7 to 8 1/2 inches incl.	...	3.50	2.50
8 3/4 to 10 inches incl.	...	4.50	3.00
10 1/2 to 11 1/2 inches incl.	...	6.00	4.00

Prices 25c more per pair west of Rocky Mountains
Sizes vary by steps of 1/8 inch above 6 1/2 inch size

CONAPHORE SALES DIVISION
EDWARD A. CASSIDY Co., Mgrs.
Madison Ave. and 40th Street, New York City

The Conaphore has a smooth front surface. Easily cleaned. Does not clog with dust or mud



NO GLARE
RANGE 500 FT.

CONAPHORE

PIERCES FOG
AND DUST

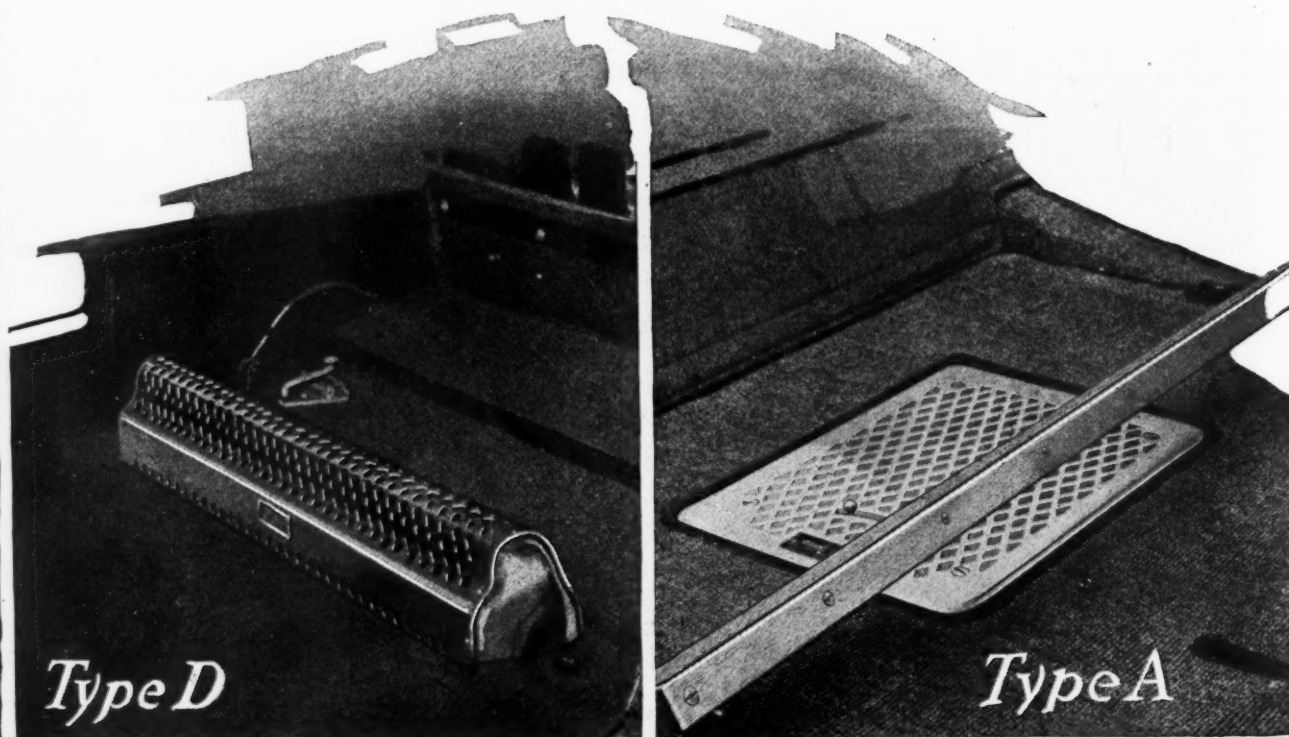
CORNING GLASS WORKS — WORLD'S LARGEST MANUFACTURERS OF TECHNICAL GLASS

When Writing to Advertisers, Please Mention Motor Age

STANDARD

300% Increase in sales of Perfection Heaters for Motor Cars

Garage installation of Perfection Heaters in existing cars was very large last fall and winter. This demand will be still greater starting with the first cool days and nights of September and October.



Type D

Type A

PARTS

for Motor Cars, Trucks,
Tractors, Motorcycles,
Airplanes and other Vehicles

Standard Parts Axles, Perfection Springs Bock Bearings Standweld Rims, Tubing, Tubular Parts

The Jobbing Trade will be looked to for supplies.

It is important that demands be anticipated for the further reason, too, that transportation difficulties, certain to come as winter approaches, may be avoided.

The merit of Perfection Motor Car Heaters is everywhere recognized.

Twenty-four motor car manufacturers now make them regular equipment on one or more models.

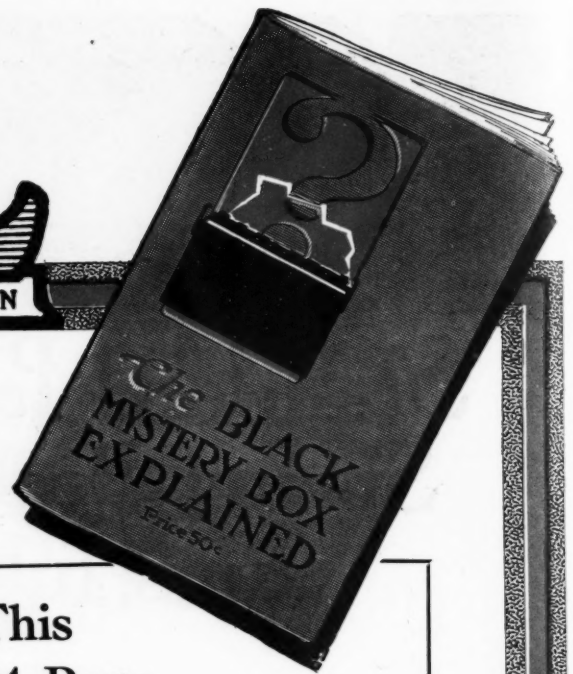
The Standard Parts Company

Executive Offices, Cleveland, Ohio

Factories: Cleveland, Toledo, Cincinnati, St. Louis, Canton,
Flint, Pontiac, Connersville and Wheeling

USL

U S LIGHT & HEAT CORPORATION



The Long-Life Storage Battery

Many USL Batteries are in their fourth year of active service, although sold on a 15 months' guaranteed adjustment plan.

To assure you of the long life built into USL Batteries, we maintain service stations in most every important town and city.

It will pay you to visit the USL Service Station in your city every week for free inspection during these hot summer months.

This 94 Page Battery Text Book

FREE

It answers hundreds of questions you ask about your battery, for example:

What is a ground? How located?
Why never add acid?
Why add water?
What causes buckling of plates?
How care for idle batteries?
What happens during charging?
What causes Freezing?
How use a Hydrometer?
How locate trouble?
What is sulphation?

We will send you this book Free if you will give us your name, address, make and model of your car.

U S Light & Heat Corporation: *Factory, Niagara Falls, N. Y.*

Branches: New York Chicago San Francisco Detroit Kansas City Washington, D. C.

NORWALK

Protected Tube and Tire Territory

In itself this is important. But not vital compared to being protected with a quality product.

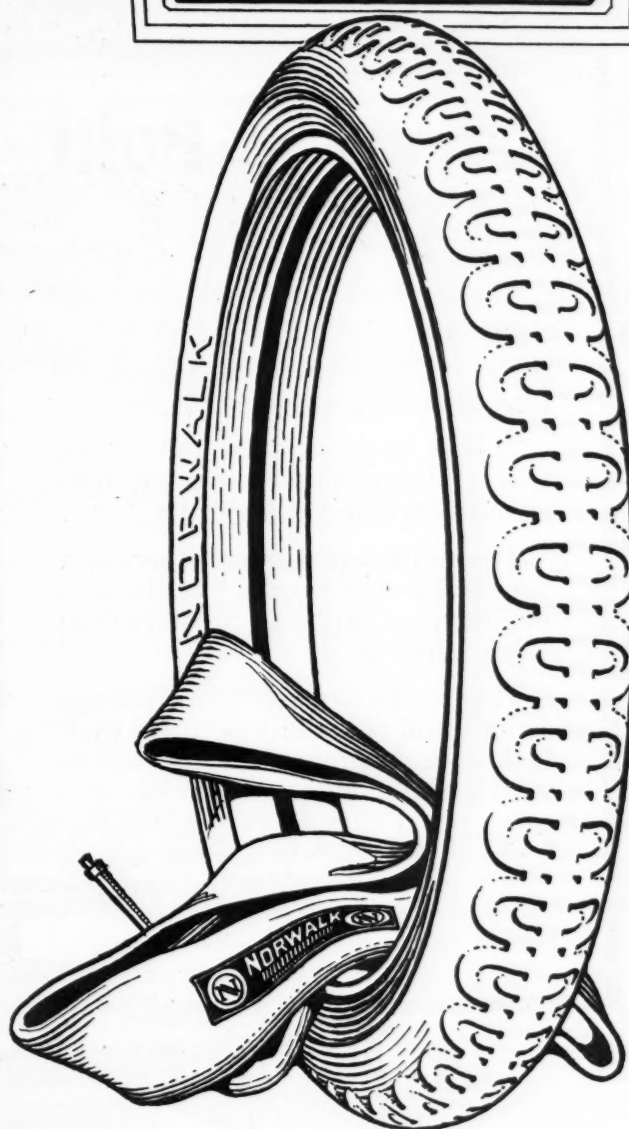
Any dealer who is up to date enough to be considered by us for the Norwalk agency has heard of this 4-year-old product. Made by men who have bred and built into these tubes and casings the traits that are separately desirable, but, when combined, unbeatable.

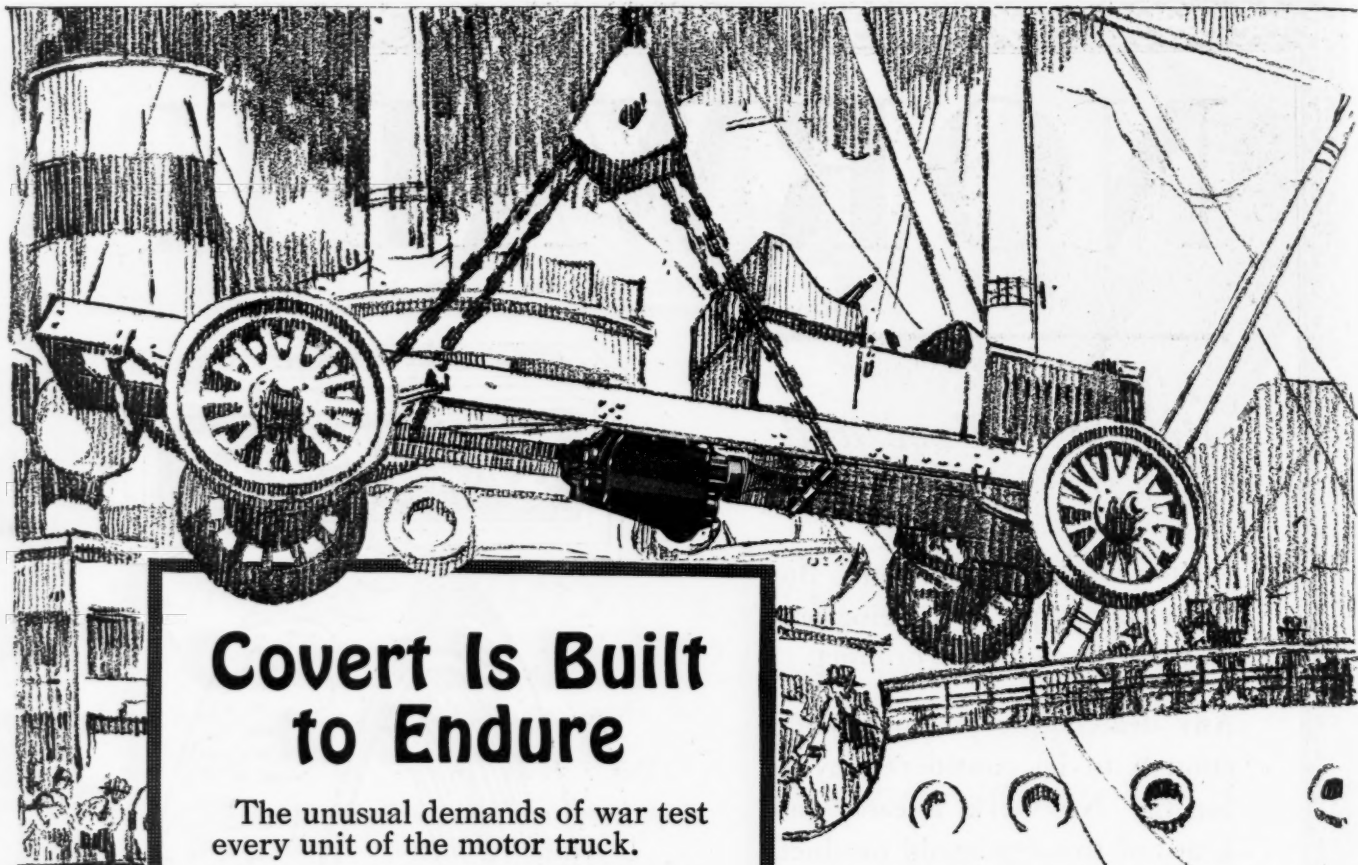
Norwalk Casings and Tubes represent the greatest opportunity offered enterprising dealers today.

A letter, wire or telephone call brings proof.

NORWALK TIRE & RUBBER CO.
NORWALK, CONN.

HIGH PRESSURE
CASINGS AND TUBES





Covert Is Built to Endure

The unusual demands of war test every unit of the motor truck.

Covert Transmissions endure such exceptional strains and stresses.

This is because each unit of the Covert Transmission is made with infinite care and exactitude.

The complete Covert Transmission is the final product of the best engineering skill, the most perfect workmanship.

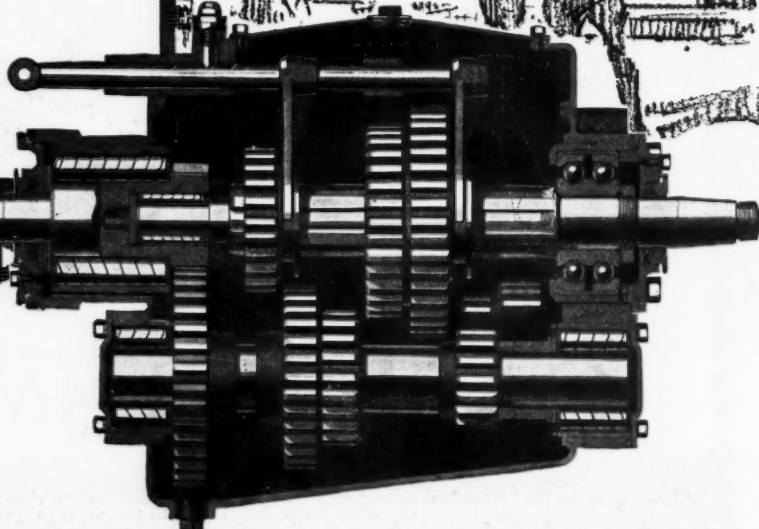
This is why Covert Transmissions quietly and efficiently perform their task in thousands of motor trucks which render unusual service.

Covert Gear Co., Inc.

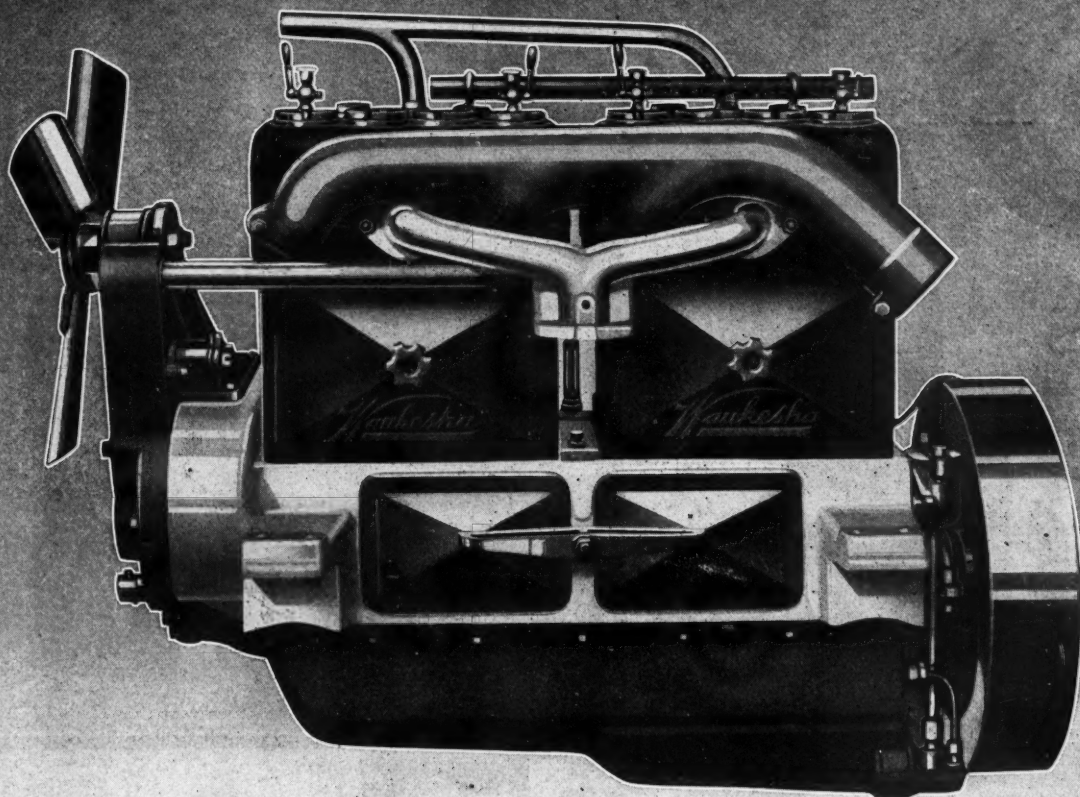
Sales, Engineering and Service

967 Woodward Ave. Detroit, Mich.

Factories: Lockport, N. Y.—Detroit, Mich.



When Writing to Advertisers, Please Mention Motor Age



War's Demands Must be Met

The unusual demands of truck and tractor users combined with the government's need of power plants for war service has produced a situation which makes it possible to furnish

Waukesha

TRADE MARK

Four-Cylinder Motors for Trucks and Tractors

to only a limited number of those who want them. While this organization is straining every nerve to take care of its regular customers and produce the government's allotment of power plants, the abnormal demands cannot be fulfilled without some delay. Patience must prevail while facilities are being expanded as rapidly as possible to make supply equal demand.

WAUKESHA MOTOR CO., Waukesha, Wis.

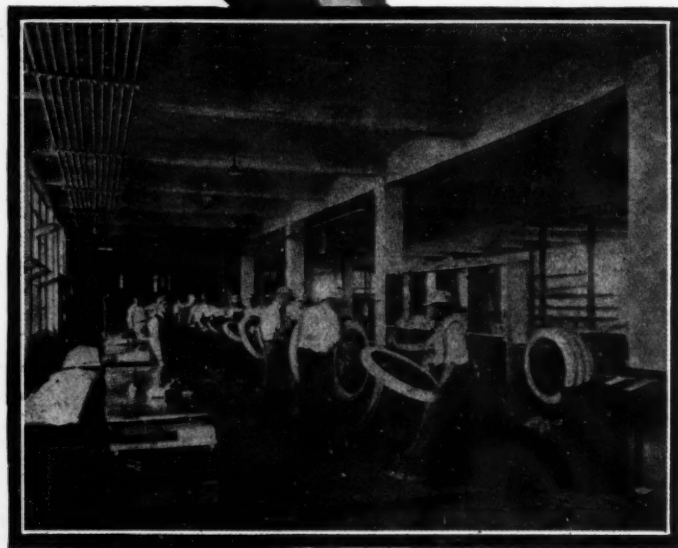
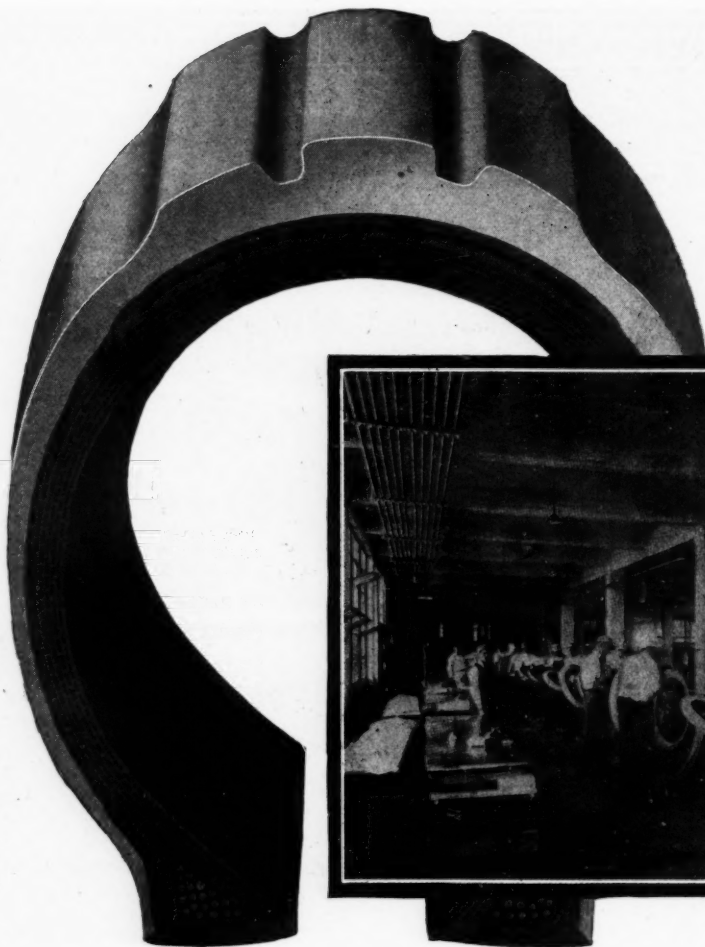
World's Largest Builders of Truck and Tractor Motors Exclusively



Guarantee 5000 Miles

While J & D Tires are guaranteed for only 5000 miles of service, it is important to remember that 99 1/2 per cent deliver this amount of mileage without the aid of adjustments.

J & D Tires are built to give mileage well in excess of the 5000 miles guaranteed, and they do.



All That Knowledge Can Build Into a Tire

The strength and wear-resisting qualities of J and D Tires are as astonishing as their resiliency.

They have a tread that is tough, wears evenly as tool steel, and a fabric carcass which is amazingly strong and pliable.

This is due to the selected grades of rubber and fabric used—to advanced methods and up-to-the-minute equipment—and to the accumulated knowledge of twenty

years' practical tire manufacturing experience—

A triple combination, which, you must agree, suggests important and unusual possibilities.

J and D Tires do not chip or flake. The sidewall remains tough and pliable and is remarkably free of tread or fabric separation.

It is not so surprising, then, that J and D Tires should so far outlive—as most of them do—their 5000-

mile guarantee. Because of this, they are far cheaper to buy than are other tires of similar price.

DEALERS: *A J and D Agency is profitable in many ways. You offer the motorist more for his money, you have a liberal margin for yourself, and every inch of your territory is protected against competition. An inquiry doesn't commit you to any obligation, so get the details today.*

J & D TIRE COMPANY, Charlotte, N. C.

New York Offices: 1834 Broadway



BRISCOE

\$885

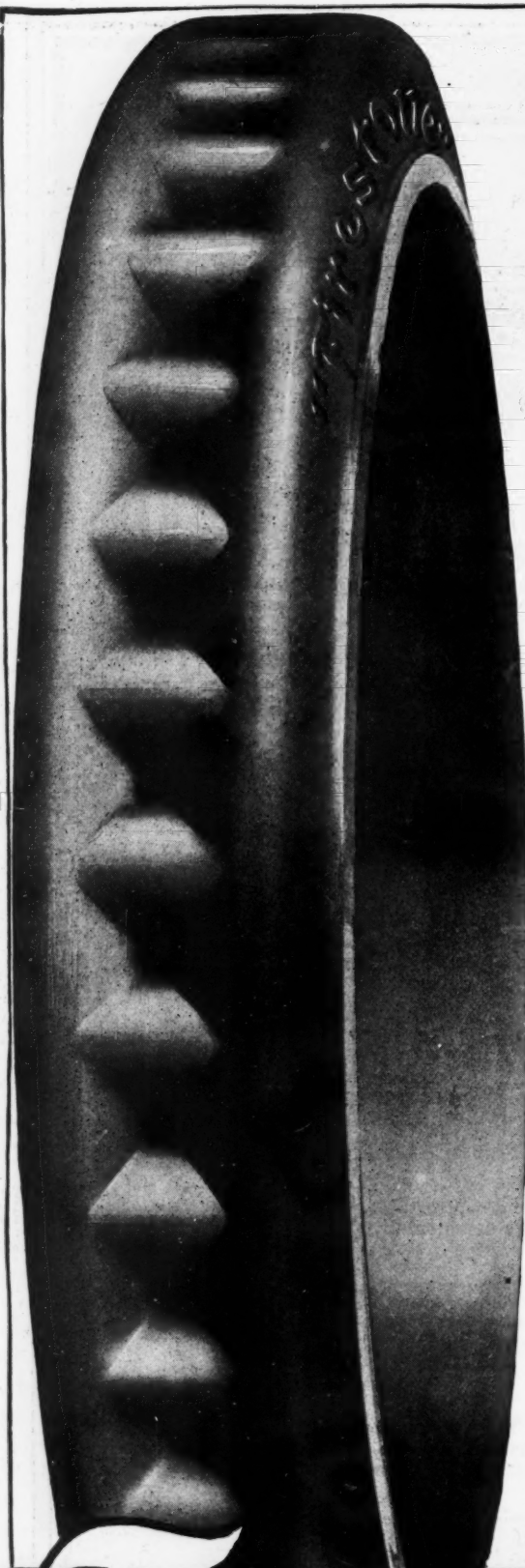
The Car with the Half-Million Dollar Motor

Power and Balance—make Briscoe cars sturdy and comfortable. Here is a car that's a champion on any road—its dependability is more than proved.

The Briscoe—\$885—represents the market's best buy. In the Briscoe, you get every motor car essential plus those extras that mean economy and comfort. The Briscoe has the famous Half Million Dollar Motor, too. Truly, this is THE utility car of the year.

99% built in the Briscoe factories at Jackson. Thus, profits to parts-makers are eliminated and the value to the Briscoe buyer increased. Write Dept. 197 for attractive dealer's proposition.

BRISCOE MOTOR CORPORATION JACKSON MICHIGAN



War-Time Demands Emphasize the Extra Values in Firestone High-Speed Tires

TRUCKS must move faster. War conditions make it imperative. Truck speeds that were efficient twelve months ago fall below today's necessity.

The situation has brought Firestone Truck Tires into greater prominence than ever.

For both the Firestone Cushion Tire and the Firestone Giant Pneumatic Tire are essentially speed types.

The Firestone Cushion Tire is the fastest solid truck tire.

The Firestone Giant Pneumatic Tire brings pneumatic protection to trucks. For extreme truck speeds this tire is indispensable.

Both these types, like the entire line of Firestone Truck Tires, possess the great resilience and sure hold of the road that make speed *safe* for mechanism and men.

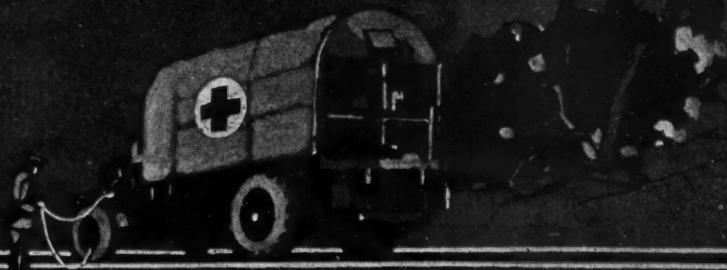
And Most Miles per Dollar is the measure of their economy.

Then there is the Firestone Giant Solid Tire with the grooved tread, which has revolutionized heavy trucking. For every type of vehicle there is a specially built Firestone tire. Our experts are at your disposal with advice as to the equipment best fitted to give you efficient, economical results. Call in the Firestone man.

FIRESTONE TIRE AND RUBBER COMPANY
Firestone Park, Akron, Ohio Branches and Dealers Everywhere

Firestone

TRUCK TIRES



**Regular
Equipment
With**

ANDERSON
CADILLAC
CASE
COLE
CUNNINGHAM
DANIELS
DRUMMOND
FIAT
FRANKLIN
HAL
HAYNES
KING
McFARLAN
MARMON
MOLINE-KNIGHT
MURRAY
NATIONAL
OVERLAND 89-8
OWEN MAGNETIC
PAIGE
PEERLESS
SIMPLEX
STANDARD
STEPHENS
TEMPLAR
WINTON
WILLYS-KNIGHT
88-4 88-8

*"These cars are
fully equipped."*

GREAT SPEED OVER THESE SHELL-TORN ROADS

*Is VITALLY Necessary in France Today—And Is Being Accom-
plished by Pneumatic-Tired Trucks—Equipped With Kellogg Engine-
Driven Pumps.*

KELLOGG

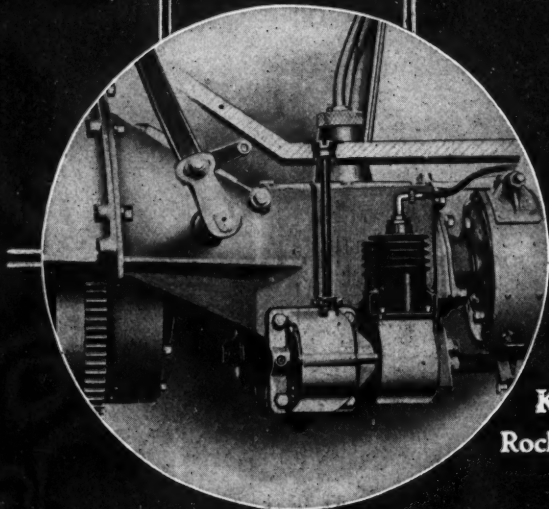
ENGINE DRIVEN

Tire Pump

KELLOGG Pumps are helping on the Firing Line in France. They are helping on the Freight Line in America—on the powerful trucks that pneumatic tires have enabled to meet speedy schedules even over winter roads.

Kelloggs have been in the "front ranks" for years. They are standard equipment on 90% of all fully equipped passenger cars; used exclusively by over half a million motorists; first in the minds of manufacturers and owners of pneumatic-tired trucks.

Kellogg Quality is more than a name. It is the natural result of years of specializing by skillful engineers supplied with every necessity in point of material and equipment that foresight could suggest or money supply. It is the concrete reason for Kellogg supremacy.



KELLOGG MANUFACTURING CO.
Rochester New York



30 minutes after you install

Within thirty minutes after you start your engine after installing Munger "Always Tight" Piston Rings, compression losses, with their attendant wastes, will be forever ended.

Engine troubles that seemed incurable will permanently disappear.

The secret of this super-efficiency is perfect and lasting FIT. Munger "Always Tight" Piston Rings FIT when you install them—and they continue to FIT.

By an ingenious method of peening these rings are made to conform to the shape of any cylinder, even though worn out-of-true. This peening also holds them to their original tension against the cylinder walls, and the wonderful "Always Tight" Expansion Joint compensates for wear as it occurs, preventing the slightest opening through which gas can escape.

Being made in one piece, these rings are not susceptible to the ailments of more complicated rings.

Put Munger "Always Tight" Piston Rings in your engine. Give them a fair trial. If they do not fulfill all our promises—if they do not do ALL you expect them to do—take them back to the dealer from whom you bought them, and he will return the full purchase price.

SPLITDORF ELECTRICAL CO.,

Newark, New Jersey

Splitdorf Branch Houses and Service Stations:

Atlanta	10-12 E. Harris Street	Newark	278 Halsey Street
Boston	68 Brookline Avenue	New York	7 W. 61st Street
Chicago	2613 S. Michigan Avenue	Philadelphia	210 N. 13th Street
Dallas	402 S. Ervay Street	Pittsburgh	5943 Ellsworth Avenue
Detroit	1295 Woodward Avenue	San Francisco	1022 Geary Street
Kansas City	1827 Grand Avenue	Seattle	1628 Broadway
Los Angeles	1215 S. Hope Street	Toronto	469 Yonge Street
Minneapolis	816 Hennepin Avenue		

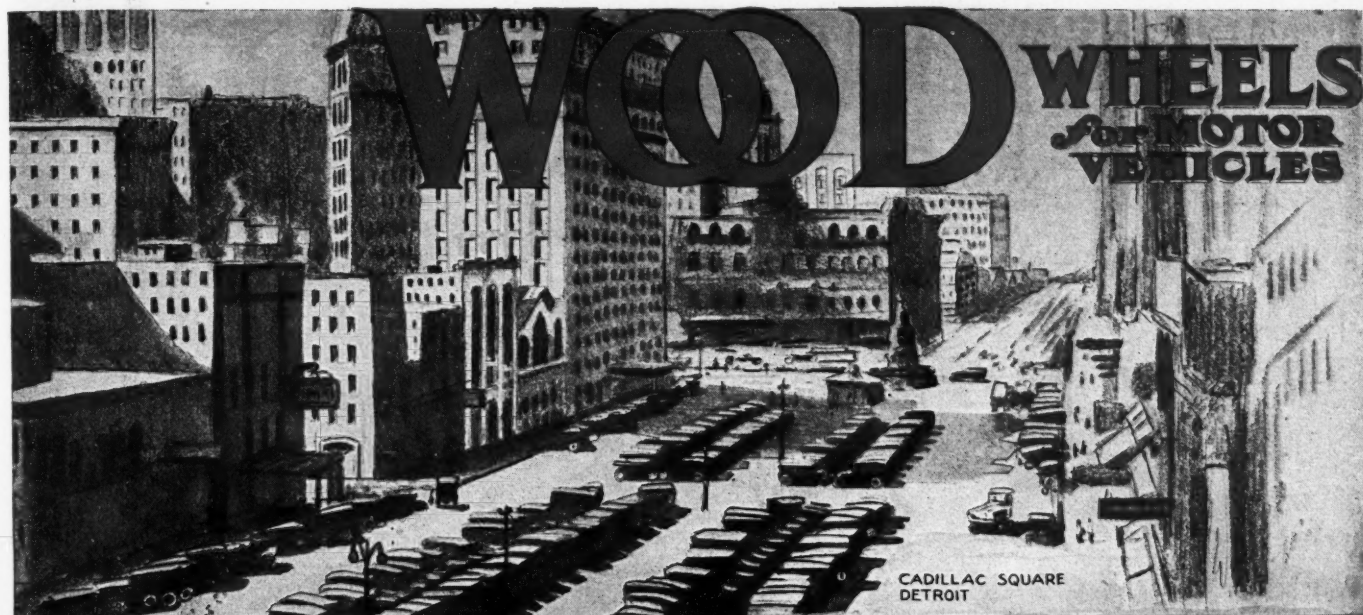


The MUNGER "Always Tight"
PISTON RING OUTFIT—
8 Regular Size Rings
4 Over-width Rings
1 Regrooving Tool
1 Ring Insertion Tool

MUNGER

"Always Tight"

Piston Rings



Most economical to maintain

Lower first cost is only one of the economies offered by wood wheels.

The assured saving in upkeep is also well worth considering.

Wood wheels require no adjustments. They need no attention other than an occasional washing.

Should an accident damage a wood wheel, repairs can quickly and easily be made by any nearby wheelwright. And, in rare cases, where a wood wheel is hopelessly broken, a new one can readily be secured at low cost.

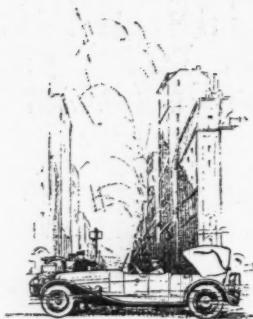
**AUTOMOTIVE WOOD WHEEL
MANUFACTURERS ASSOCIATION**

105 NORTH 13th STREET

PHILADELPHIA

**NOTE
THE
WOOD
WHEELS
EVERYWHERE**

When Writing to Advertisers, Please Mention Motor Age



Send for this valuable brake lining chart

HERE is a chart that will be a convenience to every dealer who sells brake lining. It shows you instantly the sizes and amount of brake lining and clutch facings needed on any car. It also lists the type of brakes on each. It covers all the standard cars and motor trucks and all the models of each car for three years.

It will prove useful to you, and will also interest your customers, especially the table which shows how quickly a car should stop with brakes applied when going to various speeds.

If you sell brake lining fill out the coupon now. The chart is free to dealers and jobbers.

Thermoid Rubber Company

Factory and Main Offices, Trenton, N. J.

BRANCHES:

New York Chicago San Francisco
Indianapolis Detroit
Los Angeles Philadelphia
Pittsburgh Boston London Turin Paris

Canadian Distributors:

The Canadian Fairbanks-Morse Company
Limited, Montreal
Branches in all principal Canadian Cities

SIZE CHART

Automobile and Motor Truck Brake Lining and Clutch Facings

Thermoid

HYDRAULIC COMPRESSED

100% Brake Lining

WILL YOUR CAR DO THIS?

Remember that your brake mechanism is not perfect. It is subject to wear and tear. The chart is based on the best of the best. The chart is based on the best of the best.

GRAPNALIZED

WONT GRAB

OR

SLIP

Compliments of Thermoid Rubber Company Trenton, New Jersey

Actual Size 24"x36"

THERMOID RUBBER CO.
Trenton, New Jersey
Dept. 11

Please send me your free chart showing sizes of brake linings for passenger cars and motor trucks

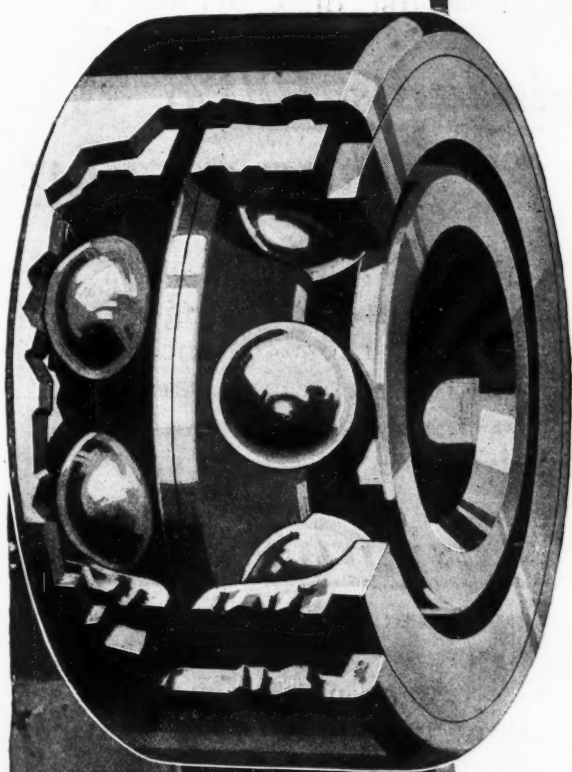
Name

Street

City, State

When Writing to Advertisers, Please Mention Motor Age

IMPROVEMENT



There's a deeper reason than that!

"We'll grant that ball bearings are the ideal equipment for our machines.

"We'll grant that the New Departure Double Row is the proper type—replacing three ordinary bearings; tamper-proof, permanent adjustment, double purpose—taking thrust as well as radial load and stresses successfully, etc.

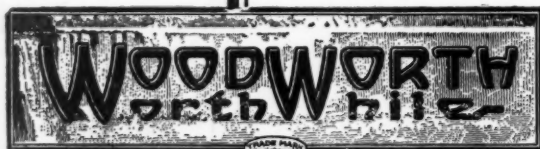
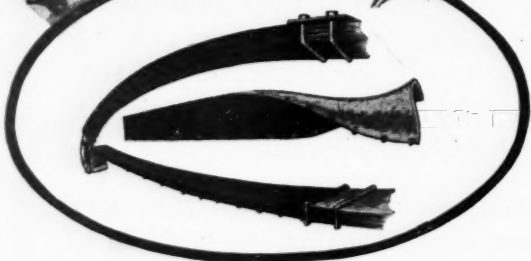
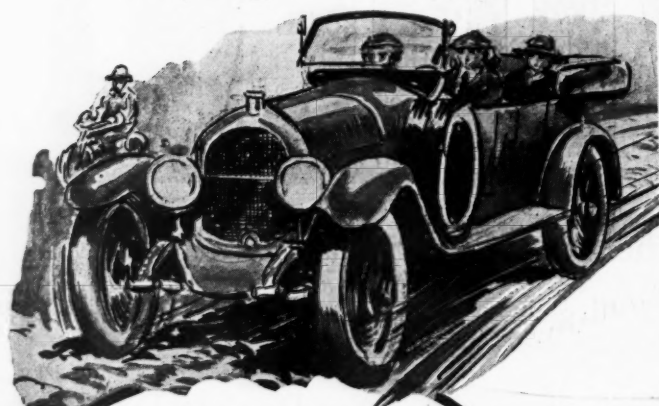
"Our decision then hangs on this point: *What's the material*—the final test of endurance? **Chrome alloy steel!** That fact fixes the New Departure at once as my choice and assures us of a trouble-proof mechanism.

"Gentlemen, we can do no better."

342

**New Departure
Ball Bearings**





Spring Cover and Lubricator

Complete Sets Delivered for	Leather	Imitation
Buick 44 and 45.....	\$10.40	\$6.20
Buick D-55	12.00	7.10
Buick E-49	11.50	6.80
Cadillac 8	15.20	9.50
Chandler	12.60	7.60
Chevrolet 490	6.00	3.60
Dodge	13.00	7.60
Ford	3.50	2.10
Franklin	17.60	9.20
Hudson Super Six.....	12.80	7.80
Overland 75-B	8.50	5.80
Overland 85 and 86.....	11.20	6.60
Paige Big 6.....	12.00	7.00
Paige Little 6.....	10.40	6.10
Saxon 6	7.30	4.30
Studebaker 4 or 6.....	14.20	8.40

This inexpensive device

is the one simple, economical solution of the "how-to-care-for-your-springs" problem. First of all, it

—insures 100% riding comfort

by lubricating and keeping lubricated all season long, every spring-leaf from U-Bolt to end of leaf, thus enabling springs to work with 100% efficiency.

—ends spring squeaks

by removing the causes and keeping them removed all season. Half-hour's attention only once yearly is necessary.

—prevents spring- breakage

by keeping the leaves lubricated thoroughly and by preventing dirt, grit, water, etc., from getting in.

Put this device on your car or cars at once. Half an hour's time, a quart of oil and it's done for a whole season!

Free Booklet on Woodworth-Worthwhile Accessories will show you many conveniences and economies

WOODWORTH MFG. CORP.

2046 Whirlpool St., Niagara Falls, N. Y.

For Canada—Niagara Falls, Ont.

DEALERS: WRITE FOR TERRITORY AND LIBERAL
SELLING AND SERVICE TERMS



COOPER "SPECIAL"

"Covers the Road with a Roar"

The Cooper "Special" Cut-out is designed to eliminate all the disadvantages heretofore found in cut-outs. It is built along mechanical lines that make it simple in construction, simple in operation and highly efficient. Every car owner who is looking for a 100% efficient cut-out that never gives the least trouble once it is installed will find the Cooper "Special" just what he wants.

COOPER "SPECIAL" CUT-OUT

Here are some of the reasons why the Cooper "Special" is proving itself the most satisfactory cut-out on the market today. A cut-out designed and built for the driver who knows a good cut-out when he sees it. The Cooper "Special" is sold exclusively on its own merits.

- The slanted flapper and large exhaust opening prevent back pressure.
- The exhaust pipe is not cut in two to accomodate this cut-out.
- The flapper is opened three inches by pushing the foot pedal down one-half inch.
- The lock on the foot pedal works instantly and never fails.

DEALERS—Get a stock from your jobber—our extensive advertising will make sales easy for you.

	No. 3 Pedal	"O" Pedal
1½" Outfits with.....	\$2.50	\$3.00
1¾" and 1⅝" Outfits with.....	3.00	3.50
2" and 2⅝" Outfits with.....	3.50	4.00
2¼" and 2½" Outfits with.....	4.00	4.50

COOPER MFG. COMPANY, Marshalltown, Ia.

Exclusive Sales Representative, **THE FULTON COMPANY,**
MILWAUKEE, WIS.



No. 3 Pedal

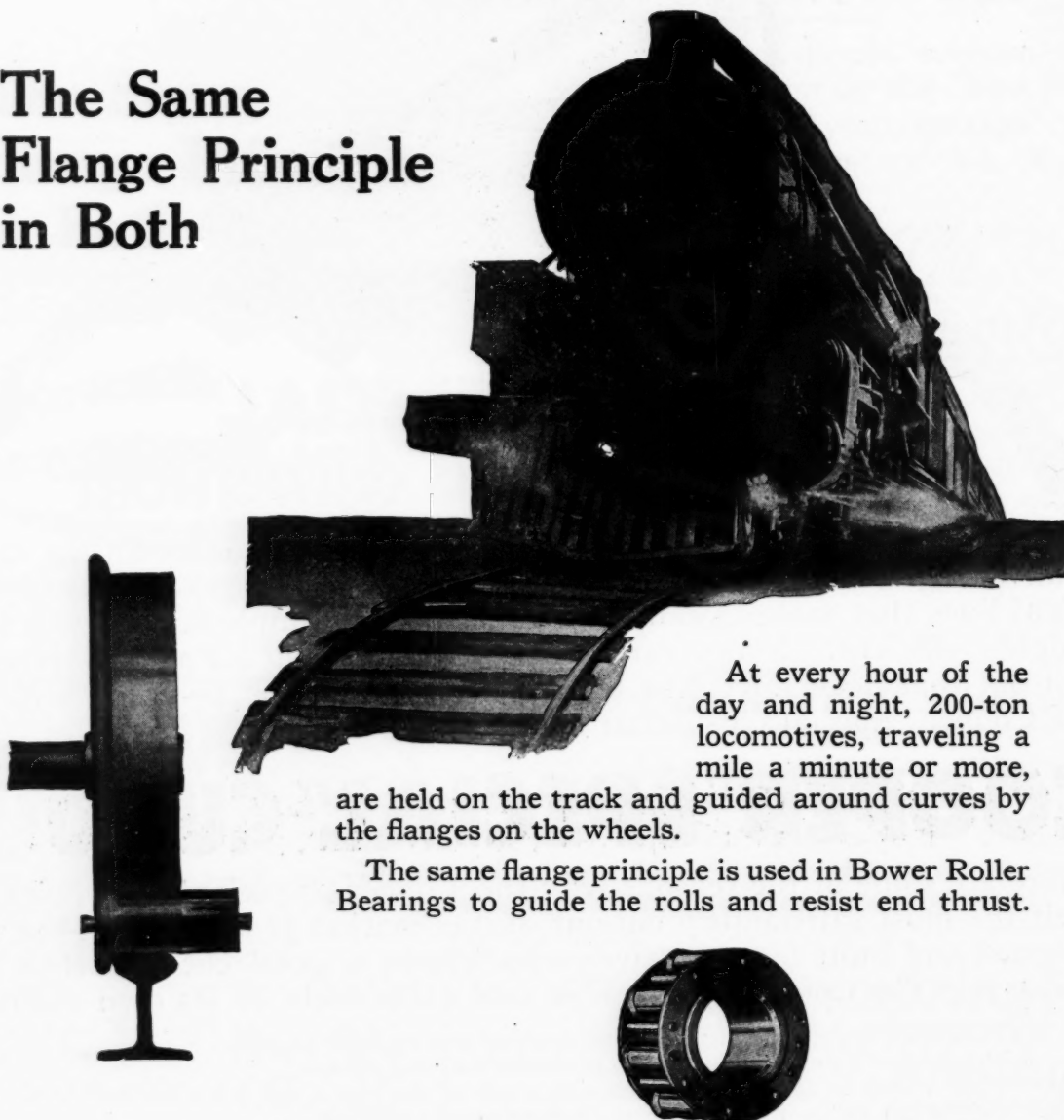
I enclose \$..... for which please send me one Cooper "Special"
to fit my make of car.....
Size of exhaust pipe is..... I buy my accessories from.....
Signed Address



Style O Pedal



The Same Flange Principle in Both



At every hour of the day and night, 200-ton locomotives, traveling a mile a minute or more, are held on the track and guided around curves by the flanges on the wheels.

The same flange principle is used in Bower Roller Bearings to guide the rolls and resist end thrust.

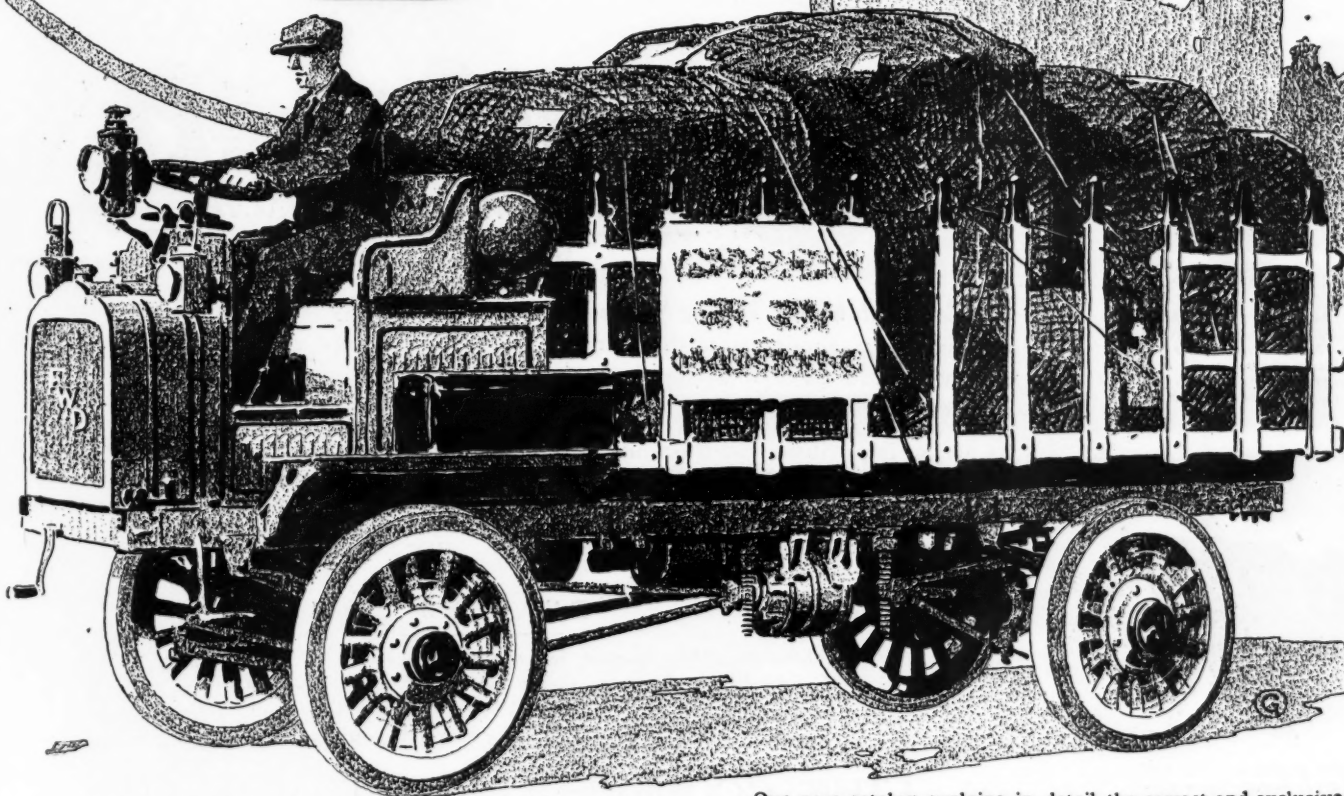
BOWER

ROLLER BEARING CO.
Detroit Michigan

Certainty

IN practically every industry users of F-W-D Trucks are recognizing their great advantages—because of the certainty with which they deliver the load. With power front and rear, the F-W-D is always able to get traction, no matter what the road conditions may be. Every wheel is a driving wheel in

FWD Trucks



Our new catalog explains in detail the correct and exclusive application of the four-wheel-drive principle as applied to the F-W-D. It also explains how the proper distribution of load increases efficiency and reduces operating cost. Send for it.

FOUR WHEEL DRIVE AUTO COMPANY
Department L
Clintonville, Wisconsin

When Writing to Advertisers, Please Mention Motor Age

There! She's Only Hitting On Three-



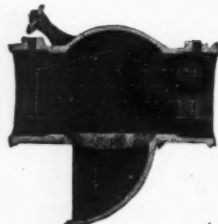
IT'S EASY TO test your motor—when your car is fitted with a Goodrich Motor Testing Valve.

Every experienced motorist is aware of the real necessity of some kind of cut-out—it affords the quickest and surest way of telling whether or not all cylinders are working and working well.

Goodrich

MOTOR TESTING VALVE

(Replacing Old Style Cut-out)



A bisected valve—showing closed position. Note the knife edge of the revolving shutter. It prevents the formation of carbon inside the valve.

The Goodrich Motor Testing Valve has a clear, sharp, ringing note that can be clearly heard above the din of repair shop or busy street.

Its action is positive and unfailing. A keen edged shutter keeps it free from carbon deposits, and thus insures quick and certain operation. When open it

completely shuts off all gases from the muffler and relieves the engine of all back pressure.

Made in all sizes for all makes of cars. If your regular dealer cannot supply you write direct. When ordering direct give year and model of car.

DEALERS


There is a big market for a Motor Testing Valve like the Goodrich. It possesses many selling features not to be found in the ordinary cut-out, yet the price is less than you would expect. Order direct for delivery through your regular jobber.

THE GOODRICH-LENHART MFG. CO.

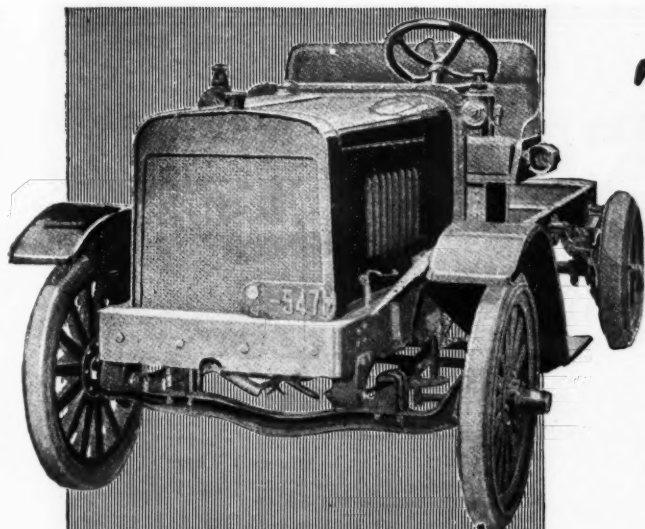
419 Widener Building

Philadelphia, Pa.

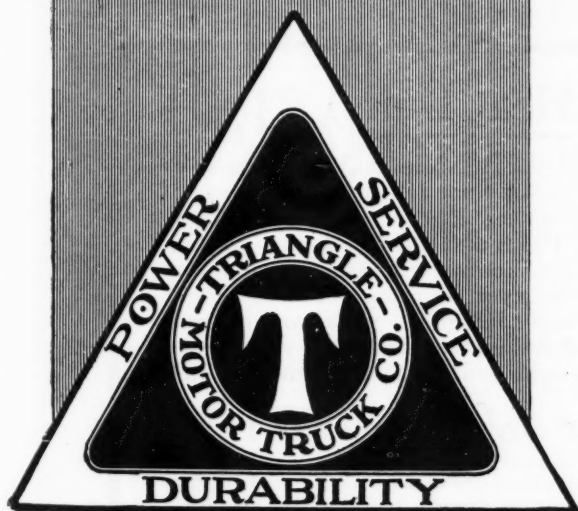
Members of the National Association of Automobile Accessory Jobbers



Open Position. The bell shaped mouth intensifies the sound and relieves the engine of all back pressure.



**IMMEDIATE
DELIVERIES!**



TRIANGLE TRUCKS

**Supply Dealers with
a Superior Line in
the Fastest Develop-
ing Branch of the
Automotive Industry**

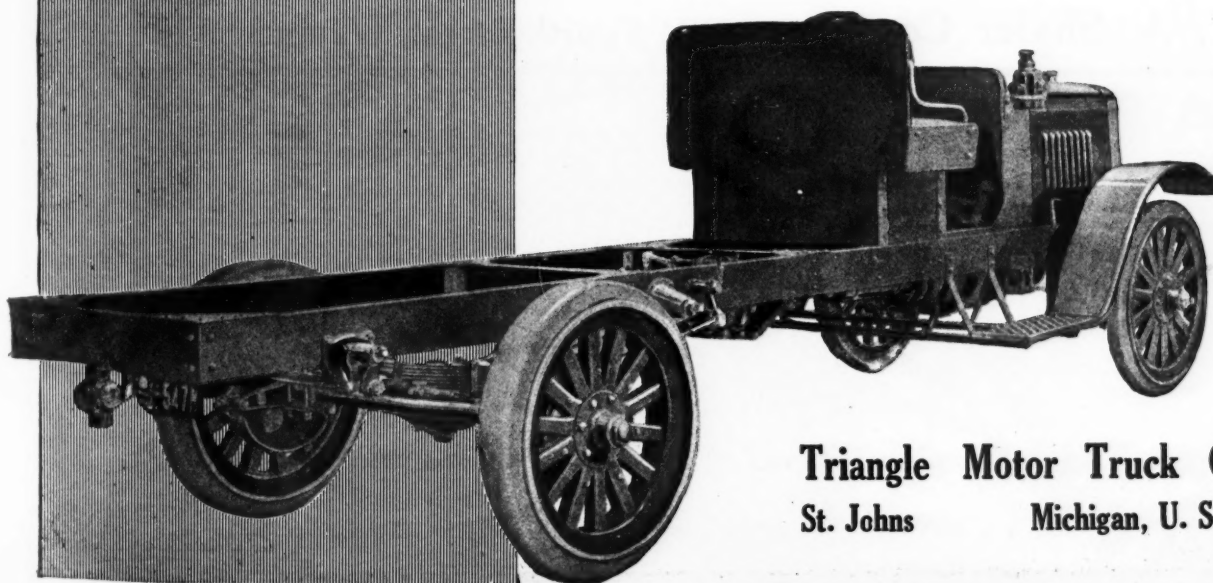
The Triangle 1½-ton model on which we can make *Immediate Delivery* offers a world of selling points—few of which can be found or are expected on trucks in the Triangle price class.

Consider the sales value of such names among the specifications as Waukesha, Eisemann, Stromberg, Celfor, Fuller, Universal, Hyatt, Bower, S. K. F., Per-fex, M. & S., Torbensen and Gemmer.

Then there is the short turning radius—23 ft., 6 inches; the service brake on the propeller shaft; the long, bronze-bushed springs, front, 2¼"x42¾", rear, 2½"x54"; the tires, front 34"x3½", rear, 34"x6", and innumerable other exclusive features.

You *know* you can sell a truck with these qualifica-tions. We can supply the trucks. Wire or write for full particulars and unusually attractive dealers' proposition.

*Immediate deliveries on 1½-ton model
Deliveries Oct. 1st on 2½-ton model*



Triangle Motor Truck Co.
St. Johns Michigan, U. S. A.



Complete (With 12 Patch & Heat Units) \$1.50

The Vulcanizer, 6 Patch and Heat Units of round shape for punctures and 6 of oblong shape for long cuts and tears are included in the outfit. Each unit is complete—ready to use. No gasoline, acid, cement or flame required.

The Patch and Heat unit is placed over the puncture—the vulcanizer clamped in position and a match applied. In 5 minutes you have a perfect, lasting, "feather-edge" repair.

The SHALER 5-Minute Vulcanizer sells itself. You only need to place the display case on your counter or in your window.

The 12 Patch and Heat Units that go with the outfit are soon used up—and the motorist comes back to you for more—at 75c a dozen.

This repeat business pays you a good profit and brings motorists to your place regularly—who will also buy other goods!

Place Your Order With Your Jobber NOW!

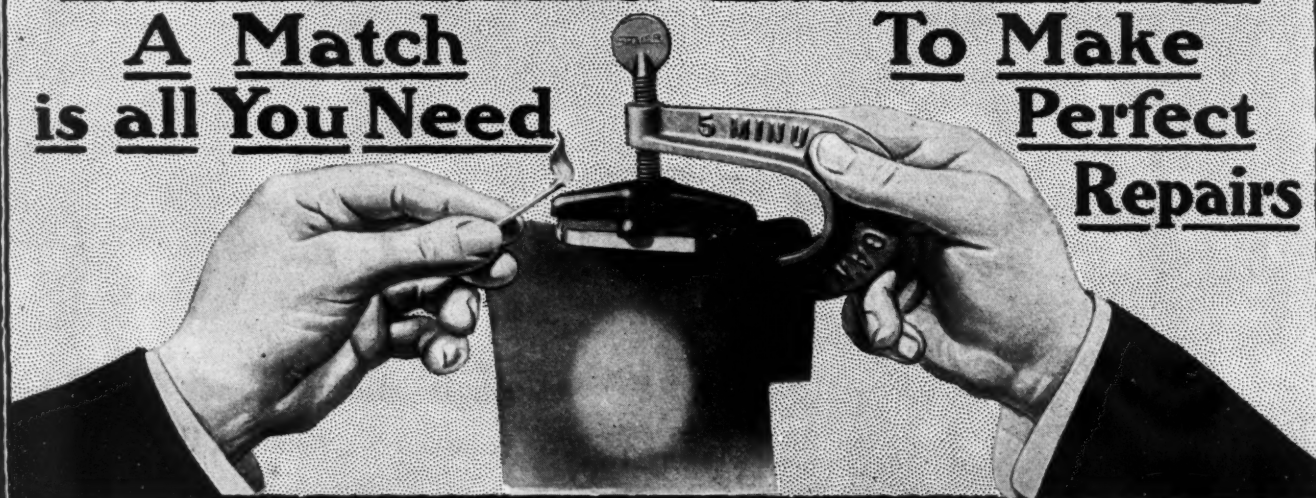
Don't delay! The enormous demand for SHALER 5-Minute Vulcanizers has exceeded our factory capacity to make deliveries. We are building a large 3-story addition to our plant—but to make sure of prompt shipments—place your order with your jobber now—specifying date of shipment desired.

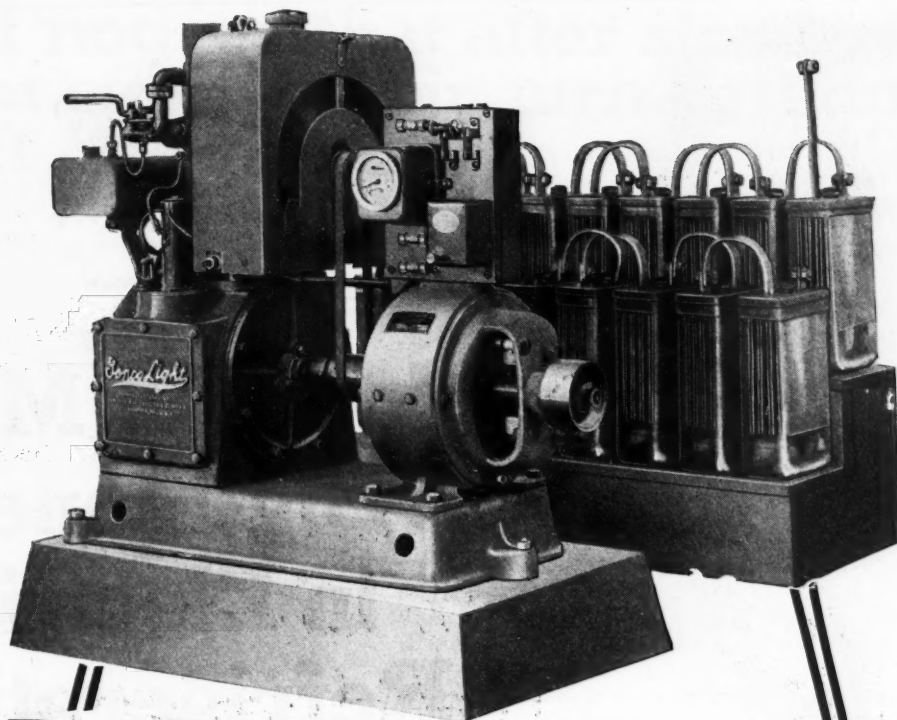
Catalog describing the complete line of SHALER Vulcanizers for Motorists and Tire Repair Shops—Sent FREE on request.

C. A. Shaler Company, 224 Fourth Street, Waupun, Wis.

**A Match
is all You Need**

**To Make
Perfect
Repairs**





Big Profits in Selling This Outfit

BIG profits await the dealer who is early in getting into the field with an electric lighting plant like the Genco Light.

The Genco Light is the sort of an outfit that farmers want—a plant that not only “does it electrically”

but also **does it mechanically** without a lot of daily watching and attention.

The Genco Light will deliver mechanical power through the belt and utilize the excess power for charging battery at the same time. It is the first and only plant yet designed which provides this advantage.

Many Special Features in the

Genco Light

Engine: High grade, vertical, 4-cycle, valve-in-head, counterbalanced crank, internal flywheel.

Carburetor: Burns kerosene, gasoline or alcohol. Adjustable handle for easy starting and for different fuels. Fuel tank holds one gallon and is connected to carburetor with copper pipe.

Ignition: Special 32 volt type, distributor and coil.

Lubrication: Improved splash system of patented design. Oil gauge on crank case indicates oil level.

Cooling System: Cellular radiator, bolted to cylinder of engine; special adjustment to suit weather conditions.

Generator: Our own design, specially constructed in our own factory. Gives high efficiency under rated load. Armature shaft supported by annular ball bearings.

Control Board: Bolted integral with generator; equipped with ampere hour meter BI-pole switch connects battery to plant. 2, 30 ampere fuses on house circuit, 5 amp. fuse on ignition circuit. All wiring

at the rear completely enclosed and protected.

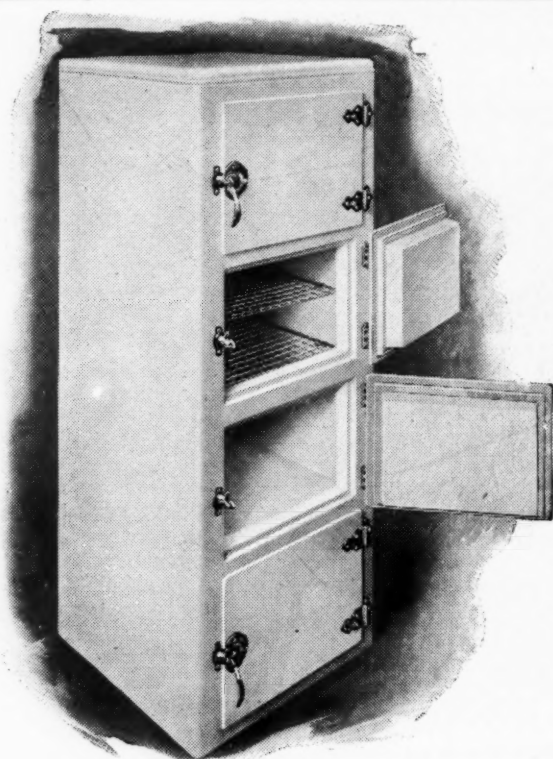
Starting Switch: Outfit is started by pressing button on control board. Special cutout stops engine automatically when battery is fully charged.

Battery: Our own special make, 16 sealed top glass jars—plates extra thick, insuring long life. Cells shipped fully charged.

Mechanical Power: Engine provided with pulley for driving machinery or line shaft direct. Engine delivers 2 H. P. for such work.

Write for details of dealer's proposition

General Gas-Electric Co.
Seventh and York Sts., Hanover, Pa.



You Can Make Big Money in Electric Refrigeration

ABOUT every ten years there comes a big money-making opportunity for the men who are not afraid to look ahead. The pioneers in the automobile industry, who had the brains to secure exclusive agencies, have since made thousands and thousands of dollars. Electric refrigeration for the home is your chance—the big opportunity for which you have been waiting. Act quickly.

Some Ice-Cold Facts

An ice shortage is here, due to the enormous war demands for ammonia. The price of both manufactured ice and natural ice is already being increased from 15 to 50 per cent. There is every indication that thousands of unprepared householders during the hottest weeks of this coming summer will find it extremely difficult to secure ice at any price unless they install

Fridger in the Home

(Fridger Does Not Use Ammonia)

Fridger does two things:

- (1) It provides Electric Refrigeration
- (2) It makes ice.

Fridger, the simple little Ice Making Refrigerator, provides convenient-sized ice cubes of your favorite drinking water. And in Fridger's extra cold compartment you can keep it for use as wanted without danger of freezing the food in the rest of the refrigerator.

Electric Refrigeration for the Home

The economy of Fridger will make a big appeal to the average housewife. Food stuffs and dairy products in large quantities can be purchased and kept in the Fridger box for weeks in perfect condition.

Electric Refrigeration is no longer a luxury. Fridger has made it a necessity, and placed it within the reach of the citizen of average income.

With the approaching ice famine thousands of home-loving people will investigate and buy Fridger—just as soon as they learn its merits. The fact that you are demonstrating Fridger will bring hundreds to your showroom who will not only be interested, but who will buy

The Men We Want

The men we want to act as sole distributors for Fridger in their respective territories must have brains and determination. We want men who are anxious to affiliate themselves permanently with the Fridger organization. The initial capital need not be large, but it should be sufficient to insure stability. If you measure up to these requirements, write us at once concerning your resources and your present connection, and we shall be glad to begin definite negotiations with you concerning an allotment of territory. But act quickly—your territory is likely to be snapped up by some one else if you delay.

FRIDGER

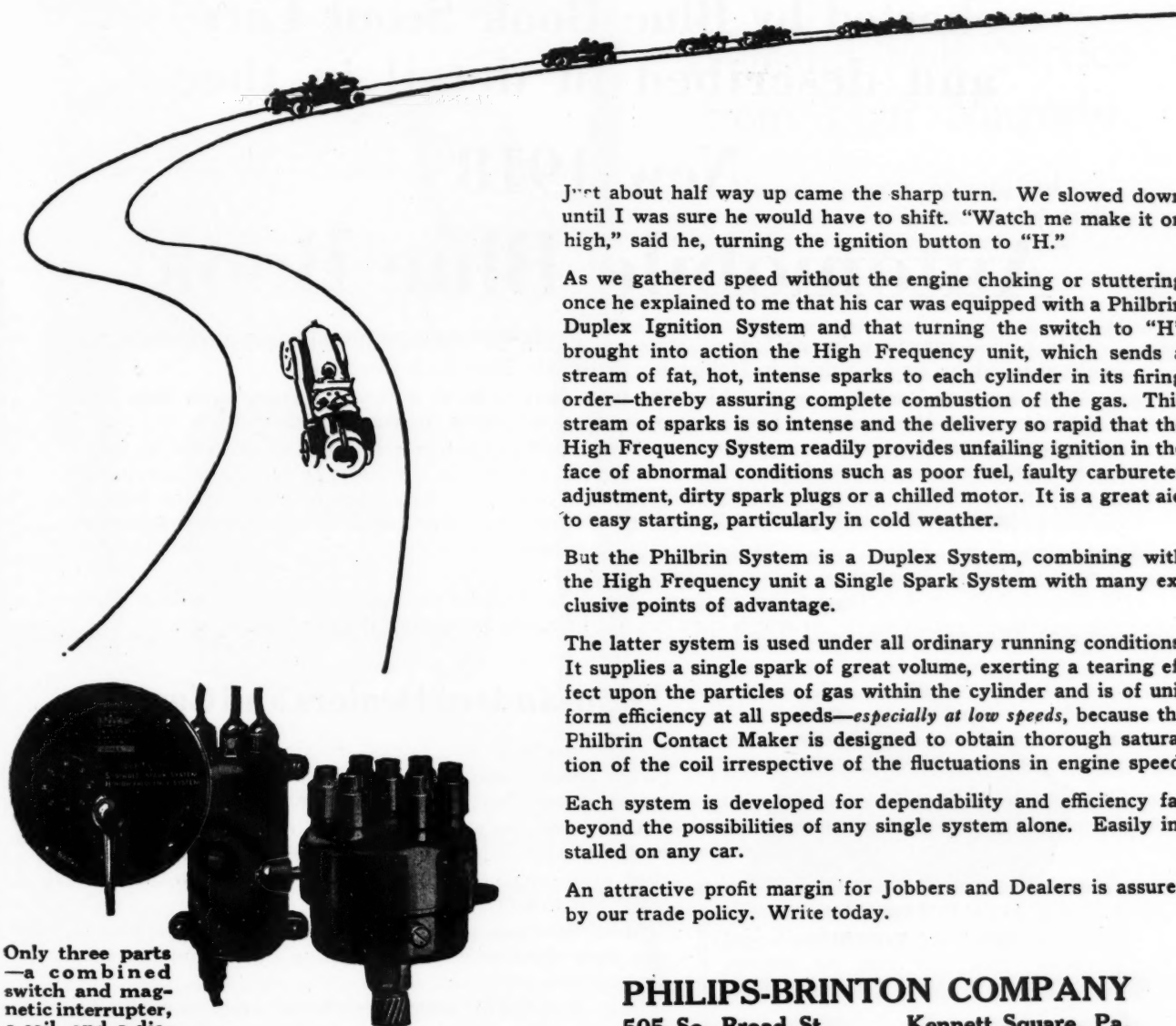
ELECTRIC REFRIGERATION

FRED W. WOLF

203 Wells Street Bridge Bldg.

CHICAGO

"and I noticed that after slowing down for that steep hairpin turn, he didn't have to shift from high"



Only three parts
—a combined
switch and mag-
netic interrupter,
a coil, and a dis-
tributer

Just about half way up came the sharp turn. We slowed down until I was sure he would have to shift. "Watch me make it on high," said he, turning the ignition button to "H."

As we gathered speed without the engine choking or stuttering once he explained to me that his car was equipped with a Philbrin Duplex Ignition System and that turning the switch to "H" brought into action the High Frequency unit, which sends a stream of fat, hot, intense sparks to each cylinder in its firing order—thereby assuring complete combustion of the gas. This stream of sparks is so intense and the delivery so rapid that the High Frequency System readily provides unfailing ignition in the face of abnormal conditions such as poor fuel, faulty carbureter adjustment, dirty spark plugs or a chilled motor. It is a great aid to easy starting, particularly in cold weather.

But the Philbrin System is a Duplex System, combining with the High Frequency unit a Single Spark System with many exclusive points of advantage.

The latter system is used under all ordinary running conditions. It supplies a single spark of great volume, exerting a tearing effect upon the particles of gas within the cylinder and is of uniform efficiency at all speeds—*especially at low speeds*, because the Philbrin Contact Maker is designed to obtain thorough saturation of the coil irrespective of the fluctuations in engine speed.

Each system is developed for dependability and efficiency far beyond the possibilities of any single system alone. Easily installed on any car.

An attractive profit margin for Jobbers and Dealers is assured by our trade policy. Write today.

PHILIPS-BRINTON COMPANY
505 So. Broad St. Kennett Square, Pa.

PHILBRIN DUPLIX IGNITION

**—with a second system to
spur the motor to super-service.**

When Writing to Advertisers, Please Mention Motor Age

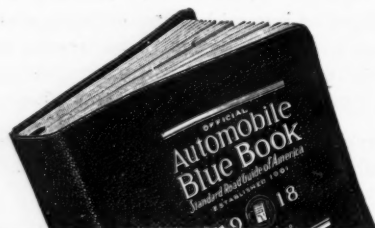
Seventeen times around the earth equals the mileage of motor roads charted by Blue Book Scout Cars and described in detail in the New 1918 Automobile Blue Book

Any place—anywhere in the United States—that can be reached by automobile—may now be easily reached by any motorist by following the simple Blue Book directions.

With the Blue Book he can plan his trips from start to finish before he starts, know how long it will take, what the roads are like, the stopping places, points to see, etc.

Then—on the road—in the car—the Blue Book will guide him every mile of the way, by landmarks and mileages; give him maps of towns and cities he'll pass through; point out the interesting places; direct him to hotels, garages and service stations when he comes to them; warn him of curves, grades and crossings ahead; give him speed laws and traffic regulations, steamship schedules and rates—it will enable him to make the trip there and back without having to ask a single question either before he starts or while he is on the way.

Known by motorists from Coast to Coast—the Blue Book is the one complete, up-to-date, practical automobile road guide on which they depend in vastly increasing numbers each year.



ELEVEN VOLUMES IN ALL THE 1918 VOLUMES

- Volume 1—New York State and Adjacent Canada.
- Volume 2—New England and Maritime Provinces.
- Volume 3—New Jersey, Pennsylvania, Delaware, Maryland, District of Columbia, Virginia and West Virginia.
- Volume 4—Michigan, Indiana, Ohio and Kentucky, excepting Upper Peninsula of Michigan.
- Volume 5—Illinois, Minnesota, Wisconsin, Iowa, Missouri and Upper Peninsula of Michigan.
- Volume 6—The Southern States.
- Volume 7—Montana, Wyoming, Colorado, New Mexico, Texas, North and South Dakota, Nebraska, Kansas, Oklahoma, Arkansas and Louisiana.
- Volume 8—California, Nevada, Utah and Arizona.
- Volume 9—Washington, Oregon, Idaho and British Columbia.
- Volume A—New York City Metropolitan Blue Book. 200 round trips within a 100 mile radius of New York City.
- Volume C—Chicago Metropolitan Blue Book. 200 round trips within a 100 mile radius of Chicago.

Bound in blue flexible binding.
Each volume \$3.00 net or \$3.15 postpaid.

Thousands of Dealers and Garages

are today selling Blue Books—making good profits—and giving their customers better satisfaction—where in former years they simply wasted time.

When you are asked for road directions, do you give your valuable time telling how—or give away a free road map—neither of which is satisfactory to the tourist or fair to you?

Motorists will pay for this information—gladly—if you show them an Automobile Blue Book—and feel better satisfied.

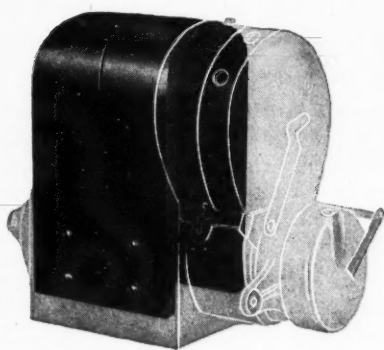
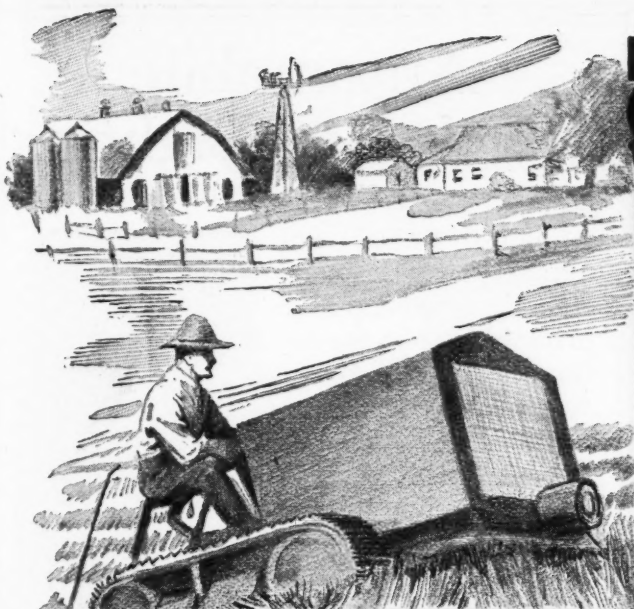
Blue Books will serve them better—and you will be selling a commodity that you now largely give away.

If you are not today selling Blue Books you are depriving yourself of many \$3.00 sales—and also of many more dollars in sales of other equipment that the Blue Books invariably bring to you.

Don't delay any longer. Send today to the nearest office for discounts and full information. Or, better still, let us send you a copy of the volume for your territory to look over. It will have to sell itself to you. If it doesn't, return it at our expense.

The Automobile Blue Book Publishing Co.

900 So. Michigan Ave. 243 West 39th Street 513 Pacific Building
CHICAGO NEW YORK SAN FRANCISCO



EISEMANN SUPER-CONSTRUCTION

3. The Magnets and Magnetic Field

The two horseshoe magnets used in the Eisemann Magneto are of the highest grade known—powerful and permanent. They fit with extreme accuracy over the pole shoes, two pieces of soft iron which are moulded into the unit-cast housing (described as point 1 of this series).

A powerful magnetic field thus is created between the pole shoes. In this field the Armature (described as point 2 of this series), driven by the engine itself, rotates on ball bearings. The low tension current so induced in the primary winding is broken at the moment of greatest intensity by the opening of the contact breaker. Thus is developed in the secondary winding the intensely hot high-tension spark for which the Eisemann Magneto is famous.

EISEMANN

Demand Full Service from Your Magneto

You should not be satisfied with a spark that will fire only under ideal conditions of carburetion and compression.

You should not content yourself with "intermittent" ignition—fair and poor by turns.

You are entitled to *service* from your Magneto—the maximum of efficiency, of dependability, of durability.

You will get it from an Eisemann.

The recognized leaders among makers of trucks, tractors, passenger cars, etc.—126 manufacturers in all—use Eisemann Magnetos as standard equipment. Do you know why? Because these manufacturers, who value their reputations highly, are convinced that Eisemann, more than any other ignition, contributes to the serviceability and standing of their products.

THE
EISEMANN
MAGNETO-COMPANY

Sales and General Offices

32d-33d Streets, Brooklyn, N. Y.

Chicago:

910 So. Michigan Ave.

Detroit:

802 Woodward Ave.

The Seal of
Dependable
Service



Trade Mark
Reg. U. S.
Pat. Off.

Self Selling Units

The Acme may not have been represented in your territory before.

But no Acme dealer has to break new ground with the Acme. For it is built of known units upon which every truck user or prospect is sold in advance.

These units are Continental, Red Seal Motor, Timken Axles, Timken Bearings, Borg and Beck Clutch, and a dozen others that are accorded the 100% rating by truck engineers.

The Acme is built of self-selling units. And that is why Acme dealers everywhere are making money steadily.

We offer an attractive dealer proposition also for which we ask you to write today.

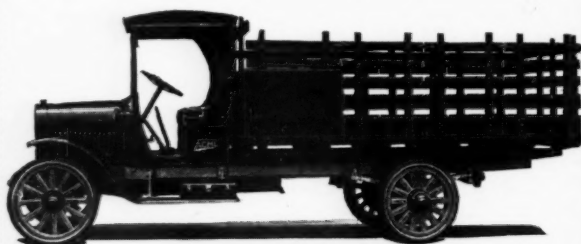
Models: 1 to 4 ton

**ACME MOTOR
TRUCK COMPANY**

Dept. 239, Mitchel St.
CADILLAC MICH.

Proved Units of ACME Construction

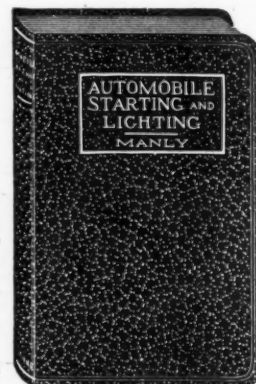
Continental Motor
Timken Axles
Timken Bearings
Timken-David Brown Worm Drive
Cotta Transmission
Borg & Beck Clutch
Ross Steering Gear
Blood Bros. Universal Joints
Smith Pressed Steel Frame
Detroit Springs
Hayes Artillery Type Wheels
Eisemann High Tension Magnete
Rayfield Carburetor
Stewart Vacuum Feed
Tubular Type Truck Radiator
Centrifugal Type Governor



Automobile Starting and Lighting

By H. P. MANLY

A non-technical explanation of the construction, upkeep and principles of operation of the Electrical Equipment of Automobiles, designed for the electrical worker, whether expert or novice. The principles used from the very beginning have been covered in detail, and the examples given are from the applications of these principles to the starting and lighting equipment of cars.



The result is a textbook of practical information, from which every unnecessary sentence has been eliminated by the arrangement adopted, yet which covers in detail all of the distinctive parts entering into twenty-four different makes of equipment now in use.

The three hundred and two pages have been divided into nine chapters, each chapter treating of some one part of this work. The logical arrangement and completeness of the whole book is best realized by an examination of the following brief outlines of these chapters.

Chapter I. Electric Lighting and Engine-Starting Equipment. Requirements. The Charging System. The Lighting System. The Starting System. Types, Uses and Constructions of the Parts.

Chapter II. Lighting Dynamos and Starting Motors. The Operation, Construction, Upkeep, Care and Repair of the Current Generating and Starting Units. Dynamos, Shunt, Series, Compound and Reversed Series Windings. Armatures, Brushes, Fields, Two-Four- and Six-Pole Machines, Output, Control, Size and Capacity. Starting Motors, Motor-dynamos, Ignition-dynamos. Double-deck Units.

Chapter III. Batteries, Action During Charge and Discharge. Charge and Discharge Rates. Charging Methods. The Cell, Electrolyte, Plates; Forming, Paste, Grids, Etc. Capacity and Efficiency, Care, Testing, Voltage, Etc. Troubles and Remedies.

Chapter IV. Lamps and Wiring. Uses of the Various Types of Bulbs, Reflectors, Etc. Focusing and Cleaning. Dimming Methods. Single, Double and Three-Wire Systems. Switches, Fuses, Circuit Breakers, Distribution Panels, Junctions, Voltage, Candlepower and Amperage.

Chapter V. Control Parts, Cutouts; Electro-Magnetic, Hand and Centrifugal. Tests and Adjustments Instructions for All Types. Constructional Details of Various Types and Makes. Care and Repair. Output Regulation. Amperage Control or Constant Voltage, Characteristics of Each Class. Adjustments, Troubles and Remedies.

Application; Constant Voltage, Constant Speed, Inherent Methods, Amperage-hour Meter, Bucking Coils, Altered Field Connections, By Battery Voltage, Carbon Resistance, Compound Windings, Iron Wire System, Line Resistance, Mercury Well, Reversed Series, Third Brush, Vibrator Systems.

Chapter VI. Drive Methods and Starting Switches, Single and Double Reduction. Ratio Required. Over-running Clutch. Bendix Drive. Rushmore System. Magnetic Switches. Magnetic Gear Shifts. Automatic and Planetary Gearing. Single and Double Contact Switches. Resistance Types, Commutating Switches, Motor Brush Switch. Motor-Dynamo Switches.

Chapter VII. Troubles and Remedies. Systematic Methods of Location. Classification of Faults, Testing, Lighting, Charging and Starting Troubles. Regulation and Cut-out Troubles. Indicating Devices, Ammeters, Voltmeters, Voltammeters, Indicators, Targets, Pilot Lamps.

Chapter VIII. Makes and Types of Equipment. Auto-Lite, Dyneto and Enls, Gray & Davis, Remy, Delco, Disco, Westinghouse, North East, U. S. L., Bijur, Wagner, Bosch and Rushmore, Splidorf, Simms-Huff, and Allis-Chalmers.

Chapter IX. Explanation of Two Hundred Words and Terms Used in Starting, Lighting, Ignition and Electrical Repairing.

302 Pages, Pocket size, 128 Illustrations.

Cloth Bound, \$1.00. Leather Bound, \$1.50.

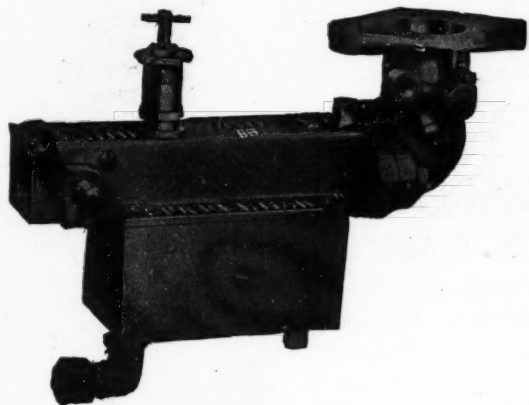
SENT POSTPAID BY

U. P. C. BOOK COMPANY, Inc.

SUCCESSOR TO MOTOR AGE BOOK DEPARTMENT
243-249 West 39th Street, NEW YORK

SUNDERMAN

Vacuum Carburetor



MODEL BB

\$8 WITHOUT CONNECTION
\$10 with regular connection
\$12 with special connection

Model F—Special for Ford, **\$6**
Metz and Saxon Four - -

F. O. B. Newburgh

Makes Good on the Hardest Job in the World

OUR success has been built entirely upon replacement business. We ask the trade to consider exactly what that means.

Such a performance is almost as miraculous as priming a ring-boned nag with a spavin and the heavens so that he wins the National Futurity.

The Sunderman Vacuum Carburetor has been called for when a car owner has been face to face with motor failings. The motor may have been carbonized, pistons may have been out of round, piston rings defective and worn, ignition may have been faulty, spark plugs fouled or short-circuited. For one reason or another the motor has been failing to deliver the power that it was supposed to deliver and at the same time it has been too costly in its consumption of gasoline. Such cars put an almost impossible task upon this excellent instrument.

But the Sunderman Carburetor Has Uniformly and Unfailingly Made Good

We have hundreds and hundreds of testimonials in our files from owners who have Sunderman Carburetors on motors which had fallen down for one reason or another, whether because of faulty design,

mechanical ignorance on the part of the car operator, abuse on his part, or just ordinary wear and tear. Testimonials come into our office every day, and it is like reading ancient history to hear the names of some of the cars on which the Sunderman Carburetor has been placed and is now making good far beyond the hopes of the men who own them. These names make you think of Old Betsy and Dobbin and the One-Hoss Shay, all the way back to the time when they built motor cars with a whip-socket on the dash.

Yet, their owners expect the Sunderman Carburetor to make good—and it does.

The Sunderman Mixing Principle Is the Reason for This Success

Surely, the Sunderman vacuum carburetor gives marvelous results on a perfectly new motor. The results it gives on worn motors are much more remarkable, and they are all due to the fundamental principle upon which the Sunderman carburetor is based. We break up the gasoline globules so finely that we secure a vaporization much better than any other mixture that has hitherto been introduced to a motor, and we thus get

more power, far greater economy, flexibility and all the other ideal requirements of the carburetor, no matter how old or in what condition the motor.

We save from thirty to fifty per cent of gasoline on any car. We save more on some cars. We give the motor a reserve of power that is a joy to a man driving through a bad road, a sandy road, a gumbo road, or up a steep hill. And we give flexibility that is the last word in carburetion.

Finally, after we have talked power and after we have talked economy, the thing that the wise car owner buys in a carburetor is flexibility, and Sunderman carburetors deliver flexibility supremely.

We have a great proposition for dealers—easy sales, substantial profits and consistently good advertising cooperation.

Car Owners, Don't Waste Any Time

Order now. Let this carburetor begin to work for you immediately, and in the first month of your driving you will not only save its purchase price in the lowered cost of the gasoline you use, but you will have a motor efficiency that you have not dreamed of before.

We take care of all orders immediately upon receipt. Write NOW

The Sunderman Corporation, 11 Chambers St., Newburgh, N. Y.

PACIFIC COAST BRANCH: 593 MARKET ST., SAN FRANCISCO, CAL.

HERE IS THE DEALER'S BIG OPPORTUNITY!

Every motorist is looking for just such a proposition as this. Shield's Injector is a grease gun that overcomes all disadvantages heretofore ascribed to grease guns in general. With Shield's Injector the grease is **never** touched by the operator. We supply cartridges of any standard make of grease. The operator simply slips a cartridge in the gun, turns the handle and puts the grease in the **exact** spot that he wants it.

No chance of greasy hands or ruined clothing—no wasted grease—no time lost. The whole operation requires only a few seconds. The gun can be carried in the car where it is always handy.



Just slip in a cartridge of grease and the gun is ready for work.



The old way that means greasy hands and soiled clothing.

SHIELD'S INJECTOR ALWAYS READY WHEN WANTED

Strong and durable in construction—nothing to break or get out of order. Absolutely the most efficient and satisfactory grease gun that has ever been placed on the market.

Made of steel, finished in black baked enamel with nickel plated ends and handle. Will last a lifetime.

DEALERS Here is a big opportunity for all dealers. We are receiving orders from all over the country which should be yours. Write at once for complete details.

WHELESS-WILSON AUTO SUPPLY CO.
SHREVEPORT • LOUISIANA



The new Shields way that means convenience, comfort and saving of time.



Price
\$6.00

JEWELL BATTERY GAUGE

The Ever Watchful
Guardian of Your Battery

**ALWAYS TELLS YOU ALL YOU NEED TO KNOW
About Your Storage Battery**

Instantly Indicates— { Short Circuits,
Failure of Charging Currents
Low Water.

Warns against Excessive Discharge before damage is done thereby and by giving this information before

the trouble occurs saves inconvenience and expense. Tells all the story clearly without messy hydrometer tests and the usual accompaniment of ruined clothing and upholstery.

A life saver for the car owner and a profit maker for the dealer.

WRITE FOR DETAILS NOW

Manufactured by
The Jewell Electrical Instrument Co.
1646 Walnut Street, Chicago

Sole Distributors
Gray-Heath Company
1440 Michigan Ave., Chicago

Satisfaction

When Doc O'Kleen Treats Gasoline

Satisfaction is a fact—and a mighty welcome fact to the motorist who uses Doc O'Kleen's prescription—there's a fine, steady profit for dealers in selling

ECON-O-KLEEN

It cleans out the carbon and keeps motors clean by introducing enough extra oxygen into the gasoline that all the carbon is consumed—turned into power.

Think of the pleasure of having no grouchy customers, no carbon troubles in the repair shop—and more profit! Users boost for Econ-O-Kleen and the store that sells it.

It is guaranteed absolutely free from picric acid or other injurious chemicals. Money back if you are not pleased.

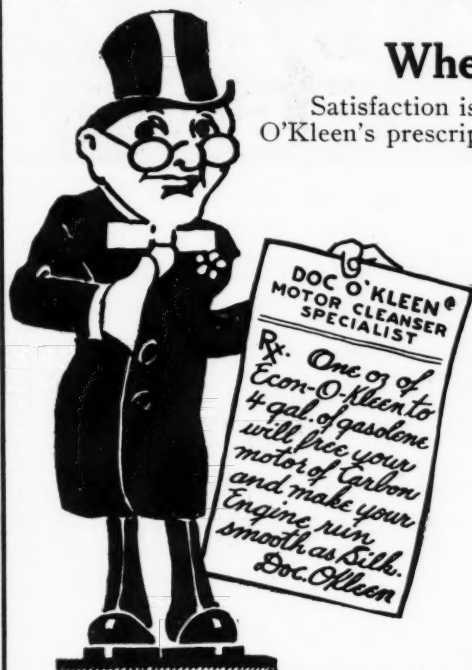
Dealers. Econ-O-Kleen sales are going stronger every day. Orders, and RE-ORDERS, man! If you could see our order file you'd stock it within twenty-four hours. We back it with a guarantee of satisfaction and protect you on the profit. Write for terms.

Send \$1.00 for trial can, prepaid. Our book, "Carbon," sent free upon request.

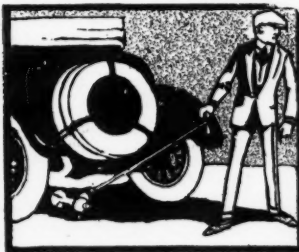
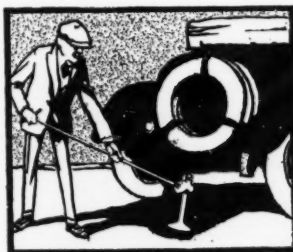
Goes In With the Gasoline



A \$1.00 can treats 112 gallons. Increases mileage and power 15% to 30%.



Econ-O-Kleen Fuel Company, 104 Labree Ave., Thief River Falls, Minn.



Every operation without once getting under the car

You don't have to get down in the road and crawl under the car to put a Kimball Jack in position. You do it with the long handle. You give the long Kimball handle a few easy turns to raise the car. To lower you simply reverse the turns, and then remove jack by the handle.

With the Kimball you avoid accidents and soiled clothing. You save time and you save labor.

Note these exclusive Kimball features

Diamond point hardened steel top with bull-dog grip. Ball-bearings carry the lift and thrust. No pawls; no ratchets. Ball socket holds handle rigid while sliding jack under car. Folds up; comes in small bag; takes up little space in tool box.

Motorists ready for a better jack

Motorists everywhere are tired of the cheap, troublesome jacks so often found as car equipment. They want a jack that will not break—one that can be operated

with least trouble. The Kimball Ball-Bearing Auto Jack fills the bill.

Dealers who use Kimball Jacks themselves say that this new principle jack is a self-demonstrator and practically a self-seller.

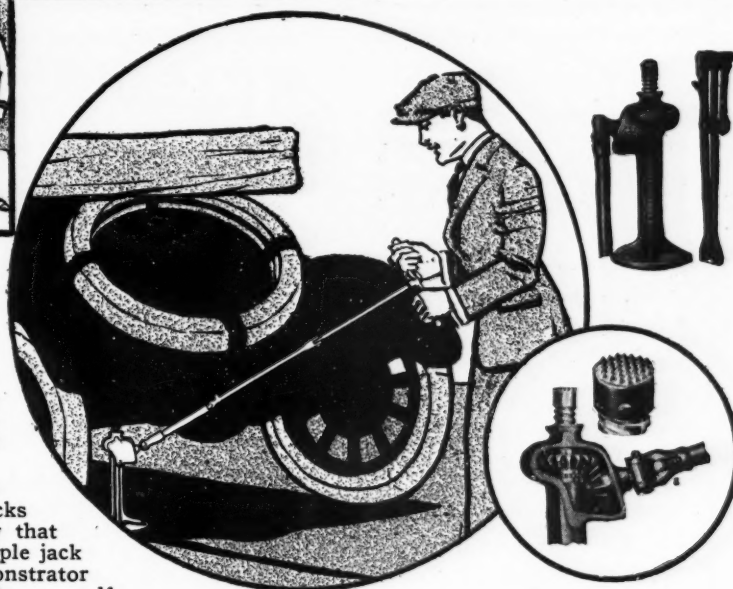
Write for complete particulars about this profitable accessory.

Sizes	Minimum Height	Extended Height	Prices
No. 1	9"	15"	\$7.00
No. 3	11"	18"	7.00
No. 4	12"	20"	7.00

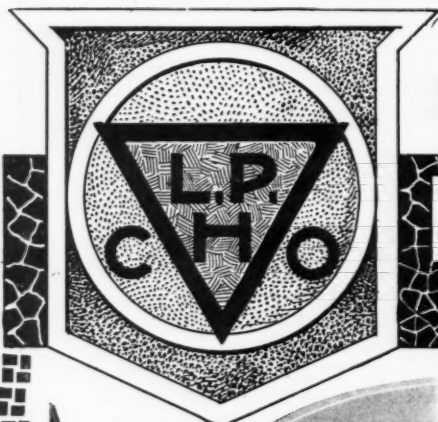
Kimball Special Jack that easily raises any style truck sells for \$15.00

KIMBALL AUTO BALL BEARING JACK

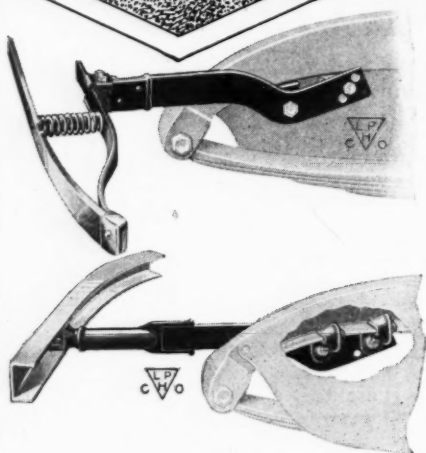
When Writing to Advertisers, Please Mention Motor Age



Sales Department
EDWARD A. CASSIDY CO., INC.
Madison Ave., at 40th Street, New York
Manufacturers, F. W. Mann Co., Milford, Mass.



THE NEW UNDER FRAME CLAMP HALLADAY BUMPERS



The most thoroughly 'Universal Bumper' on the market. Attached in a minute and *stays* till you take it off. No cutting of any part. No rattle or noise. Steel extension and unbreakable clamps, fitted with all the HALLADAY bars.

HALLADAY Class, Finish and Quality throughout.

L. P. HALLADAY COMPANY, Streator, Illinois



The Curtis Sign

Illustrated above—is 10x14 inches—baked enamel on steel. Cannot be bought, but is furnished FREE with every CURTIS Garage Air Compressor—and cannot be had in any other way.

Install a Curtis Air Compressor

Display a CURTIS "FREE AIR" SIGN above your door—it inspires confidence and will help build your business. Motorists are looking for this familiar CURTIS slogan—because they know oil rots tires—and that a CURTIS Air Compressor furnishes AIR FREE FROM OIL, which means fewer blowouts, greater tire mileage and less repairs. The CURTIS is the ONLY Garage Air Compressor with the controlled splash oiling system that eliminates all danger of forcing oil into the air line.

CURTIS AIR FREE FROM OIL

Investigate the many exclusive features of CURTIS Garage Air Compressors. The line is complete—five sizes—stationary or portable. Just write your name and address on the margin of this advertisement—tear it out and send it to your jobber, or to us direct, for complete information and prices.

Curtis Pneumatic Machinery Co.

1527 Kienlen Ave., St. Louis, Mo.

Branch Office—530-H Hudson Terminal, New York City



When Writing to Advertisers, Please Mention Motor Age

DYKE'S AUTOMOBILE AND GASOLINE ENGINE ENCYCLOPEDIA

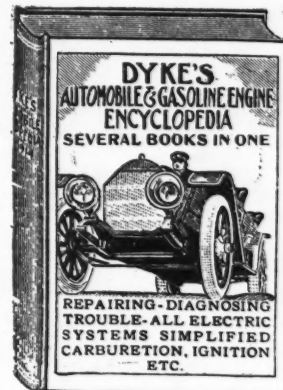
A practical, simplified book on Automobile Construction and repairing written in short, terse paragraphs—right to the point—with a liberal use of blackface type, and with the illustrations so clear that a person may understand them without the use of the text.

Many new ideas have been incorporated in the present edition—the illustrations, for instance, are all in the form of charts instead of being scattered through the text. They are all arranged in progressive form. For example, the building of a complete car—such parts as the engine, transmission, etc.—are illustrated in the order in which the work should be done.

The new Seventh Edition revised and enlarged in 1918 is a complete treatise on Electric Ignition and Electric Starters and Generators—Adjustments, Tests, etc., of leading Electric Systems—Repairing and Adjusting—Carburetion—Ignition Valve Timing—Engines and Parts—Opera-

tion and Care of Car—Digest of Troubles with a Dictionary of Motoring Terms, etc. Complete instructions on the Ford, Packard Twin Six, King Eight and Airplane Engines are also given.

One Hundred and Fifty Thousand copies have been sold on a "money-back" basis, and not one has been returned. There's a reason—Order yours now.



916 Pages, 7x10 Inches, 3362 Figures.

Cloth Bound, \$3.80 Delivered

U. P. C. BOOK COMPANY, Inc., 243-249 West 39th St., New York

DRESS UP YOUR CAR WITH A DRIDEK TOP



The Most Remarkable Top Material Yet Produced

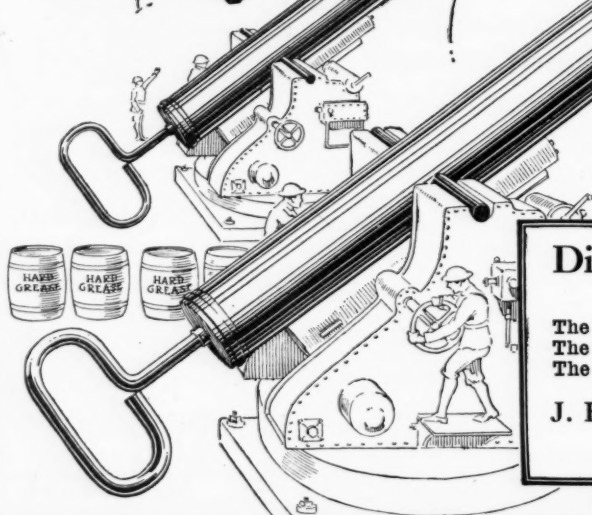
Light and strong, will not scratch or blister
Distinctive and attractive in appearance

Send for Samples and Price List to Dept. C

L. J. MUTTY COMPANY, Boston, Mass., U.S.A.



The ROSE GREASE GUNS Make a HIT Every Time



First in War
Used by the U.S. Army and Navy
First in Peace
Backed by an Army of Satisfied Users

Distributed by Most Jobbers & Dealers

MADE IN THREE SIZES

The Rose Auto Gun for the individual car owner.....Price \$1.80

The Rose Universal Gun for the car, truck and tractor. Price \$2.50

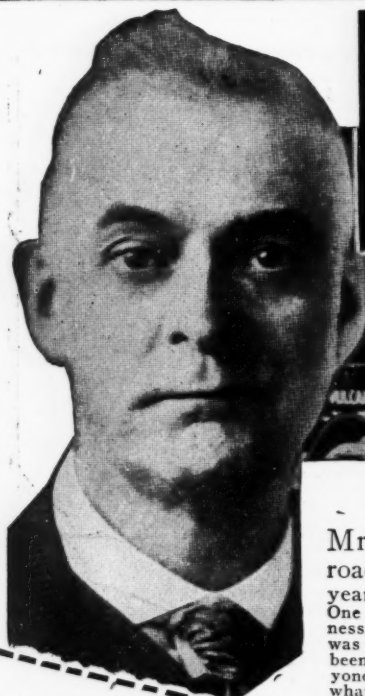
The Rose Shop Gun for the garage and repair shop....Price \$3.50

J. H. HANEY & COMPANY

HASTINGS, NEB.

MANUFACTURERS:

ROSE TIRE PUMPS and ROSE GREASE GUNS



I EARNED \$2200.00 IN FOUR MONTHS

This Is Richard A. Oldham

Mr. Oldham was telegraph operator for the Illinois Central Railroad for twenty years. He is fifty-eight years old. During all those twenty years, he drew the customary monthly salary of a telegraph operator—no more—no less. One day he read one of my advertisements and the possibilities of making money in the Auto Tire Repair Business. In a few weeks he had purchased and installed a Haywood outfit, and was doing business for himself. He was **His Own Boss**. A short time ago he wrote us that his income in four months was as much as it had been in Two and One-Half Years as Telegraph Operator. You men who have been left at home—who are beyond the draft age, can and must take up the burdens left behind by others. Oldham is a living example of what can be done. I have 500 places to be filled now. 500 stations where tire repairing is neglected, because there is no one to do it.

M. HAYWOOD, Pres.
HAYWOOD TIRE &
EQUIPMENT CO.
501 Capitol Avenue, Indianapolis, Ind.

Dear Sir: Please send me your book on Haywood Tire Repair Plants and full particulars on your National Tire Repair Service and details of your FREE school of tire repairing.

Name

Address

I Must Have 500 Men to fill these places within the next sixty days

I have a big interesting book to send you—a book about tires—it explains this business—gives inside figures and profit. Gives actual proof of success—letters of others who are now operating Haywood Shops and making big money. What these men have done you can do. \$2,500 to \$4,000 a year is conservative. One machine will give you a start. You can see business all around you—everywhere there are automobiles there are tires that need repairing. You know that. All you do is open a shop—put out a Haywood sign, and auto owners will come to you and the service you bring them.

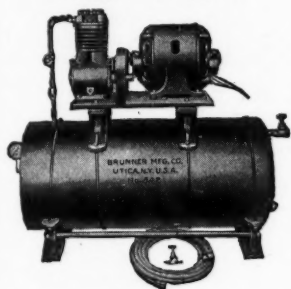
Sign the coupon and mail it today, or send a post card or letter.

HAYWOOD TIRE & EQUIPMENT CO.

M. HAYWOOD, President

501 Capitol Avenue, INDIANAPOLIS





OK
 WE USE A BRUNNER AIR COMPRESSOR
FREE AIR
 FOR YOUR CONVENIENCE
OK

*"The Garagemans O.K."
 is behind the Brunner Sign."*

The Brunner Air Sign has been used by thousands of garages for years. The Brunner Sign was the first air sign designed for the garageman's use. Having back of it the garageman's O. K. As a business builder there is no guess work about what a Brunner Sign will do in the way of advertising the fact that your garage is in a position to render prompt and efficient compressed air service.

You can secure the trade of the Brunnerwise motorist by installing a Brunner Air Compressor in your garage and displaying the Brunner Sign.

In these war times labor saving equipment is playing a big part in the administration of every business—a Brunner Automatic Air Compressor Outfit would save labor for you and secure the trade of the Brunnerwise motorist as well.

Write for No. 15 Catalog and Name of the Brunner Jobber Covering Your Town

BRUNNER MANUFACTURING COMPANY

General Offices and Plant: Utica, N. Y.

Cincinnati Branch: Cincinnati, Ohio

Getting the Day's Catch Home

**MORE DEALERS
WANTED**

A happy day at your favorite fishing grounds when the fish are biting well—it's fun that's hard to beat. Then there's that string of big ones to take home. But how are you going to carry them—and keep them fresh until you get home? It's easy if you own a

Hawkeye BASKET REFRIGERATOR

Carries the luncheon going—the day's catch coming back. Keeps contents fresh, cool and clean for 36 hours. Strong, lightweight, attractive, sanitary. Priced as low as \$5.00. Thirty days' trial.

Write for Booklet 42

Burlington Basket Company Dept. X 223 Hawkeye Bldg. **Burlington, Iowa**



When Writing to Advertisers, Please Mention Motor Age



One of America's Great Trucks

Strength and ruggedness for city and inter-city hauling — an abundance of power for any emergency — dependability that keeps it a stranger to repair shops. These are the built-in qualities of

ONEIDA TRUCKS

They are qualities which rank it as one of the great trucks of America.

DEALERS! Write or wire Your territory may still be open

PROMPT DELIVERIES

ONEIDA MOTOR TRUCK COMPANY
GREEN BAY, WISCONSIN

1, 1½, 2, 3½
and 5-Ton
Models
All Worm
Drive



Eastern Factory Branch, 211 W. 19th St., New York. Central Western Factory Branch, 1626 Harmon Place, Minneapolis, Minn. California Distributors, Bunnels Motor Sales Co., 141-7 Grove St., San Francisco. Eastern Virginia Distributors, Oneida-Norfolk Truck Co., 786 Granby St., Norfolk, Va.



Now That Fords Have "Gone Up" in Price—

and with a possibility of further advance, there's more need than ever for DUPLEX Equipment

You pay more for a Ford today than you did a year ago. You may pay even more—if it is possible to obtain a car at all—a year from now. "Hedge"—protect your Ford with a

DUPLEX Cantilever Spring System For Fords

Most scientifically right spring system ever devised for Ford use. Guards against jars and vibration. Relieves mechanism of road strain. Lengthens car's life amazingly. Saves big on repair bills. Puts off necessity of new car buying. Ready to install. Fully guaranteed.

30-DAY MONEY BACK TRIAL

Price per set of four only \$18. Order direct from ad or write for complete descriptive matter. Save your car—save cash—enjoy greater riding ease.

DUPLEX CANTILEVER SPRING COMPANY
178 N. Dearborn Street CHICAGO, ILL.



Ohio Karbon Killer

Keeps Spark Plugs, Valves, Pistons and Cylinders free from carbon—all the time.

Don't let your engine choke up with carbon until it can't run, and then remove it—**Prevent it!**

Put Ohio Karbon Killer in your gasoline, and prevent the formation of carbon, thus keeping your engine in the very best condition at all times.

Costs \$1.00 per lb., and a pound treats 480 gallons of gas. Get a can right now, and give your engine a chance. If your dealer cannot supply you, send your dollar to

THE OHIO GREASE COMPANY
Box 121, LOUDONVILLE, OHIO



for 150 makes of cars.
Write for full information
and prices on wire wheels
for any make or model of car.

DEALERS!

Wire Wheels are sellers! Get particulars of wire wheel service and sales agent's propositions. Ford distributors and accessory dealers should write for special service and sales proposition for HOUSE type Wire Wheels for Ford cars.

Wire Wheel Corporation of America
(Successors to Houk Mfg. Co.)
835 Eleventh Ave., at 57th St., New York

HOUSE TYPE for Fords

List price for sets of 5 wire wheels, 4 inner hubs, 4 hub caps, hub cap wrench, spoke nipple wrench, 1 hub dust cover for spare wheel, \$60. White, black, red. Color optional.



Have You Had Trouble With Your Tires?

The fault is not with the tires. You, or your chauffeur, or both, are to blame. The responsibility is yours because you should keep the tires pumped up to a specified pressure, and don't.

Tires that are kept up to the proper air pressure last twice as long—sometimes ten times longer—than tires that are run with not enough air in them. Measure your air daily with a

SCHRADER UNIVERSAL TIRE PRESSURE GAUGE

and get out of your tires all the miles they can give.

Price in U. S. A. **\$1.25**

At your dealer or

A. SCHRADER'S SON, Inc.

783-803 Atlantic Avenue, Brooklyn, N. Y.



SCHRADER

Are You Wise?

Do you know the detailed specifications of all passenger cars and motor trucks? Do you know the sizes and prices of all tires and tubes sold on the American market? Do you know the size and style of all electric bulb equipment for all passenger cars?

Every first of the month issue of Motor World presents the correct detailed specifications as above indicated. They are invaluable to men in the trade. Motor World is designed and edited for dealers, jobbers and garage owners exclusively. Published weekly. Fifty-two special and regular issues for two dollars per year. A big value—and getting bigger. Send your subscription to

MOTOR WORLD

239 West 39th Street, New York City

PIERCE Governors

If You Demand Proof—

Perhaps you have wondered if it really mattered to you, as a dealer, whether or not the trucks you sold were equipped with a governor.

Perhaps you have said to yourself, "Yes, I realize the speed of the truck motor must be automatically controlled if it is to give the service expected of it, but I supposed one governor is as good as another."

You are mistaken.

Pierce Governors Are Standard On Eighty-nine Makes of Trucks

Would this be the case if it did not matter whether or not there was a governor on the truck? Would this even be possible if Pierce Governors were not the very best to be had? No, you have to admit it's pretty good proof of superiority, don't you?

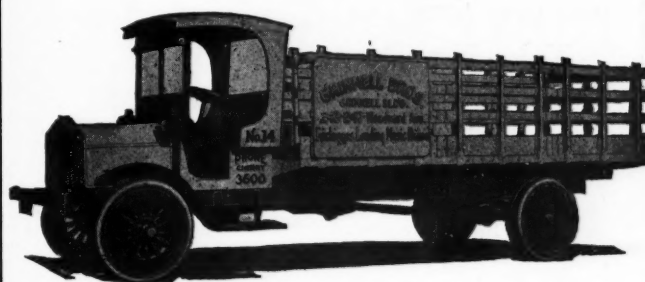
Then you should demand Pierce Governors on the trucks you sell.

Literature sent upon request

The Pierce Governor Company

"World's Largest Governor Builders"

Anderson, Indiana



Columbia Trucks

Growing rapidly in favor because they are built right and stay right. There's a Pierce Governor on every Columbia Truck.



Out Standardizing Standardization

It has been said that perfection dwells in the realm of the impossible.

Don't you believe it.

There is absolute, positive, definite, dependable perfection.

Not one lone, isolated illustration, but millions upon millions of mirror-like polished, glistening steel balls—Hoover Steel Balls—daily pouring out of the most wonderful plant of its kind in existence.

And, should you select at random, any day or every day in the year, one, or a hundred thousand steel balls out of the millions, you would find absolute perfection personified.

It could not be otherwise, because under the direction of L. J. Hoover, the founder of this gigantic and vital American industry, nothing has been left to chance.

All previous methods of testing steel ball accuracy has been far outdistanced by Hoover systems—guesswork and approximate perfection find no resting place in the great Hoover Steel Ball factory.

HOOVER
STEEL BALL
CO.,

HOOVER
STEEL BALLS

Ann Arbor,
Michigan,
U. S. A.



At Our Risk— You Can Prove It

Don't waste good money on tire pumps that either break your back, or pump Rubber Rotting oil particles or gasoline fumes into your tires.

Take No Chances

At our risk you can prove that the "Dead Easy" is quicker, safer, easier and cheaper than any other tire pump, either engine drive or hand power.

Convenient to carry with any car, it is always ready for instant service. The gauge showing exact tire pressure, there is no guesswork—and it's "Dead Easy."

FREE TRIAL OFFER

Write today, NOW,
for fifteen day—no-money-in-advance—free trial offer.

GLOBE MANUFACTURING COMPANY
BATTLE CREEK, MICHIGAN, U. S. A.



Gasoline At 18¢ a Gallon

If you could get a badge which entitled the wearer to a cash discount of 33⅓% each time he bought gasoline, you'd want one right away, wouldn't you? There isn't such a badge in existence, but there is an equally effective method by which you can slice a third off your gasoline bill—besides improving the running of your car.

The REMINGTON GASOLINE SYSTEM

FOR YOUR FORD

insures perfect control, greater flexibility, greatly increased mileage and a saving of one-third on gasoline bills. The Remington Gasoline System is a system which is simple in construction and operation—a system which any garage man can attach in a short time *without cutting the floor board*. It provides you with a real foot accelerator and insures perfect control—giving the same ease of operation enjoyed by owners of the most expensive cars. It gives you more power, more mileage, will save you hundreds of gallons of gasoline each year—and it sells for only \$7.50 complete.

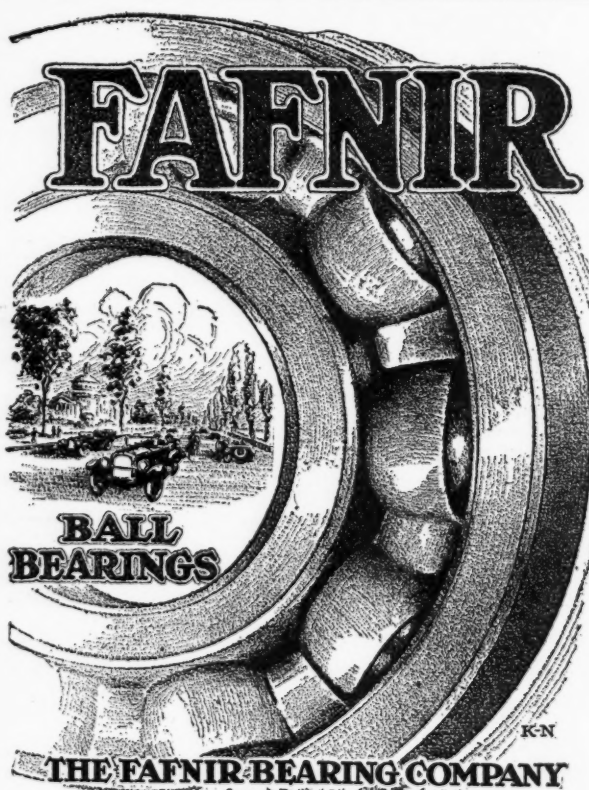
Can you honestly afford not to investigate.

The Remington Mfg. Co.

1142 Real Estate Trust Building

PHILADELPHIA

CHICAGO OFFICE: 62 East Lake Street



Conrad Patent Licensed
Main Office and Factory: New Britain, Conn.
Detroit Office: 752 David Whitney Bldg. Chicago Office: 1929 So. Michigan Ave.



Beauty of Glass a Factor in Selling Cars

Manufacturers of automobiles realize the value of beauty as a sales factor. Consequently they demand glass of high quality—at a reasonable price.

Crystal Sheet Glass, while considerably less expensive than plate, possesses every element of beauty and quality essential to high grade automobile construction.

It is strong, uniform in thickness, perfectly transparent, and of the proper degree of flexibility.

Ask us to explain in detail why Crystal Sheet is the logical glass for your cars.

AMERICAN WINDOW GLASS CO.

World's Largest Producer

GENERAL OFFICES: FARMERS BANK BLDG.
Pittsburgh, Pa., U. S. A.

MORE LITE AUTO LENS



MORE-LITE sales are mounting higher and higher every month. No other lens has risen so quickly in popular favor. Over 600,000 pairs were sold during the past year. There is a double reason—More Light, Less Cost.

Live dealers find MORE-LITE a paying proposition.

Crystal, \$1.50 to \$2.25. Amber, \$2 to \$3.

L. E. SMITH GLASS CO.

Office and Factory

MT. PLEASANT, PA.

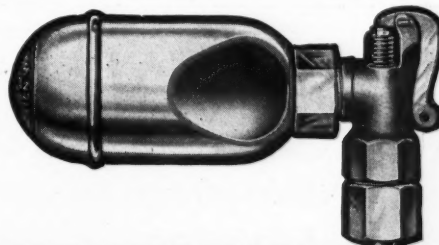
*The Hollenden
Cleveland*

"Home of The Cleveland Auto Club"

THE Hollenden caters to people who know and demand the best. In its accommodations, its cuisine, its service throughout, high level is maintained continuously.

EUROPEAN PLAN WITH BATH
For One Person.. \$2 to \$5
For Two Persons.. \$3 to \$6
With Twin Beds.. \$4 to \$6
Suites at Various Prices.

Ample garage facilities immediately adjacent
Official A. A. A. Hotel



Through Crowded City Streets

When driving through the traffic-crowded streets of busy towns and cities nothing will so ease the strain as the knowledge that your warning signal is strong, commanding, and absolutely dependable. The

BUELL EXPLOSION WHISTLE

will add 100% to the pleasures and ease of motoring. It is a metal whistle—not a horn—that attaches to the motor and operates with full explosion pressure of the engine. Never needs adjustment or cleaning. Will outlive any car and is backed by a 10-year Guarantee. Equipment on such cars as White, Pierce-Arrow, Little Giant and 31 others. Price \$4.25 Single Tone, \$6.00 Chime. At your dealer or sent direct.

Buell Manufacturing Company
1608 S. Michigan Ave., Chicago

Dealers: A letter to us will bring profits to you.



Winton Six

War means strenuous work for everybody, and strenuous work demands steady nerves. Finish your day with a run into the open. Breathe off the day's burdens and insure restful sleep, soothed nerves, and the power to go forward another day.

Write for catalog

THE WINTON COMPANY
424 Berea Road, Cleveland, Ohio

Selden Trucks

Light Delivery 1, 2, 3½ and 5-Ton

Write for full information on the Selden Line



DEALERS: Write or wire for desirable territory

Selden Truck Sales Company
Rochester, N. Y., U. S. A.

Auto-Lite

Starting,
Lighting
& Ignition

Electric Auto-Lite Corporation

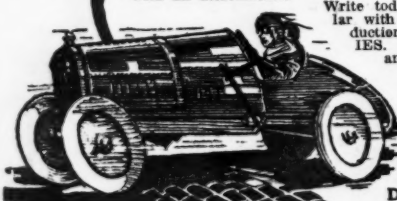
Head Office and Factory
Toledo, Ohio

Detroit Sales Office
1507 Kresge Bldg.

SPEED-DASH-CLASS

Own a lively, snappy looking PACO RACER. Modeled on French streamline design. Fits any Ford Chassis. PACO BODIES are patented. None others like them. Strong molded steel body. Low hung they cling to the road. Comfortable seats and easy riding. Shipped complete with all attachments.

Write today for 3-color circular with photographic reproductions of PACO BODIES. Get description and prices. Write today.



PACOMFGCO
Dept. 25, PEORIA, ILL.

SCHEBLER CARBURETOR

AT ANY OF THE FOLLOWING BRANCHES OR SERVICE STATIONS

Elyea-Austell Co., Atlanta, Ga.; W. J. Connell Co., Boston, Mass.; The Wheeler-Schebler Carburetor Co., 2021 Michigan Ave., Chicago, Ill.; Pennsylvania Rubber & Supply Co., Cleveland, Columbus, Akron, Ohio; Ferris-Dunlap Auto Supply Co., Dallas, Texas; The Auto Equipment Co., Denver, Colo.; Herring Motor Co., Des Moines, Ia.; The Wheeler-Schebler Carburetor Co., 876 Woodward Ave., Detroit, Mich.; The Equipment Co., Kansas City, Mo.; Reinhard Bros. Co., Minneapolis, Minn.; Interstate Electric Co., New Orleans, La.; James C. Nichols, Inc., New York City, N. Y.; Manufacturers' Supplies Co., Philadelphia, Pa.; The Automobile Accessories Co., Pittsburgh, Pa.; Ballou & Wright, Portland, Ore., and Seattle, Wash.; Fred Campbell Auto Supply Co., St. Louis, Mo.; Weinstock-Nichols Co., San Francisco, Los Angeles, Oakland, Calif.; Canadian Fairbanks-Morse Co., All Principal Canadian cities.

THE WHEELER-SCHEBLER CARBURETOR Co. Inc.
INDIANAPOLIS - INDIANA

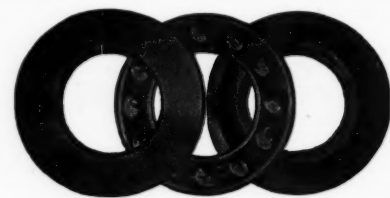
ATTENTION!

Manufacturers of Automobile Accessories

For lack of sufficient capital to manufacture in quantities to supply the demand I would like to arrange with some reliable firm to manufacture and handle the sales end of a useful and thoroughly practical automobile accessory on a royalty basis.

The demand for this item is BIG, the profit is BIG and I want a BIG Concern that wants to get BIGGER, to take hold of it. If you are this kind of a Concern write for particulars.

Box E 861 Motor Age



Ball Thrust Bearings

Retainers for Cup and Cone, Thrust and Magneto Type Ball Bearings

Western Office THE BEARINGS COMPANY OF AMERICA
FORD BLDG., DETROIT LANCASTER, PA.

KINGSTON CARBURETOR

Save Money by Economizing Gasoline

Four floating bronze ball valves opening automatically under different motor suction supply a uniform mixture at any speed regardless of hot, cold, wet or dry weather.

Write for details and let us tell you why so many manufacturers are adopting this carburetor as standard equipment.

MADE BY THE OLDEST MANUFACTURERS OF CARBURETORS IN AMERICA

ESTABLISHED 1895
BYRNE, KINGSTON & COMPANY, Kokomo, Ind.

Crankshaft Machining Absolutely Accurate and Dependable

We have the knowledge and experience (20 years), the latest machinery, and the capacity to fill large orders promptly and exactly. Let us estimate on your work.



"MOLTRUP FOR QUALITY"

Moltrup Steel Products Company, Beaver Falls, Pa.



Immediate shipment, VULCAN seven leaf heavy, oil tempered, fronts for the Ford. 588 other types, 90,000 springs in stock. Liberal discounts.

JENKINS VULCAN SPRING CO.

Factory and General Offices, Richmond, Indiana
Branches with full stocks

St. Louis, Missouri	- - -	1402 Chestnut Street
Minneapolis, Minn.	- - -	1024 Hennepin Avenue
Dallas, Texas	- - -	209 South Houston Street
Reading, Pa.	- - -	538 Franklin Street
Sumter, S. C.	- - -	29 Caldwell Street

THE LUXURIOUS MOTOR-CAR UPHOLSTERY



MOHAIR VELVETS

MADE BY SANFORD MILLS

Scores of Fast Color Patterns. Write for Samples

L. C. CHASE & CO., BOSTON

New York Detroit San Francisco Chicago

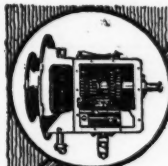
SPRINGS YOU ARE SURE OF

No uncertainty as to service or wear of
HIGGINS QUALITY SPRINGS
FOR REPLACEMENT

No center breakage—new rib construction prevents it. Absolute security from tip to tip—combined with utmost riding comfort. Squeak and rust-proof. Painted black. Ready for installation. For all cars. Quick service. Big discounts to dealers. Write for catalog C-1917 and prices.

HIGGINS SPRING & AXLE CO.
Dept. 21, Racine, Wis.

NO BOLT-NO HOLE-NO HUMP

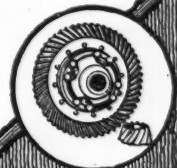


More than 180 automobile and truck manufacturers use

BROWN-LIPE TRANSMISSIONS

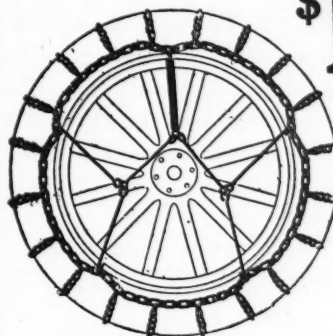
BROWN-LIPE CHAPIN DIFFERENTIALS

Made in
Syracuse, New York



\$1.00

for a pair of these Chain Tighteners keeps your chain from running too loose, and insures against losing them.



Merchant's Anti-Skid Chain Tightener

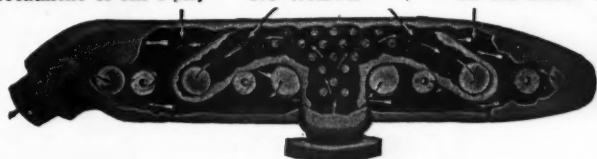
catches chain at five points, gives even tension all around, allows chain to creep, but not to slip, around wheel and can be used on any tire. A simple, light, neat, durable device which is easily carried and easily applied and means safety and real economy.

If your dealer can't supply you, write us direct

M. H. MERCHANT, 236 Emma St., Syracuse, N. Y.

HOT-PIN MANIFOLD for FORDS

Exhaust and Pins This Hot-Pin Chamber Exhaust Gases Heat
Assure Uniform Heat Breaks Up All the Fuel the Pin Chamber
Treatment of All Fuel NO WASTE On All Sides



40% to 50% Increase in Gasoline Mileage
Guaranteed or Money Refunded. Enlivens
Low-Grade Fuel by Pre-Heating Mixture

Price \$16.50 complete. Send for Literature. Dealers Wanted

K. B. C. CO., Dept. B., 2015 Michigan Ave., CHICAGO

BURD High Compression PISTON RINGS "The Accepted Standard"

BURD HIGH COMPRESSION RING CO.
ROCKFORD, ILLINOIS
Sales Offices in All Principal Cities.

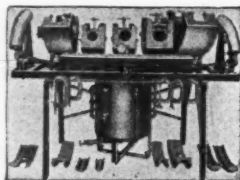


THE Mercer shield is the badge of fastidious taste in automobiles. Mercer means the utmost in substantial smartness, riding comfort, and power. The possessor of a Mercer invariably feels a bit better satisfied than the owner of another car. Correspondence from dealers invited.

Mercer Automobile Company :: Trenton, N. J.
800 Whitehead Road

BUILD UP BIG BUSINESS-MAKE BIG MONEY

Open a tire repairing shop. Men starting without experience—now making big money. We instruct you free. Outfit pays for itself. We have 1,000 more vacancies to fill. Golden opportunity.



But be sure—get the RIGHT Outfit. There is but one that operates upon CORRECT principle—the

Vanderpool Vulcanizer

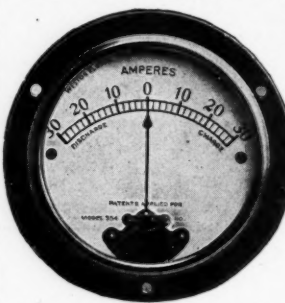
Only vulcanizer recommended by leading tire factories because the only one that repairs tires EXACTLY as THEY WERE MADE.

THE VANDERPOOL CO., OHIO
SPRINGFIELD

In answering, address Dept. B.

Reduce the Risk of Accident!

Suppose your lights went out suddenly, without warning, on a black night, with a bad road. Don't chance it. Put a



Weston

MODEL 354 AMMETER

On Your Dashboard or Cowl

It is the reliable means of determining the proper rate of charge or discharge of your battery for various speeds. It enables you to determine that the generator is working and that the storage battery is receiving its proper charge. Write us.

Weston Electrical Instrument Co.
10 Weston Ave., Newark, N. J.
23 Branch Offices in the Larger Cities

THE B & D PORTABLE



The big advantage of this drill lies in the fact that you do not have to let go with either hand in order to stop it when the bit breaks through. You just pull the trigger and cut off the current.

The steadiest, most satisfactory and economical hand drill ever made. Universal Motor (any current), ball thrust bearings, Chrome vanadium steel gears, forced draft cooling system. Fully guaranteed.

Write for full description

THE BLACK & DECKER MFG. CO.
111 Pratt Street, Baltimore, Md.

Canadian Distributors

Sales Representatives in England

ATWATER KENT

SCIENTIFIC IGNITION

ADDRESS ALL COMMUNICATIONS TO
4934 STENTON AVE., PHILADELPHIA.

Elgin Six

Chicago-Built Motor Cars

5-Passenger Touring	\$1,165	4-Passenger Roadster
All-Weather Sedan	\$1,645	Military Scout Model \$1,245

Every Elgin Six Combines Distinction,
Endurance, Economy and Comfort

Elgin Motor Car Corporation 2427 South Michigan Blvd.
Chicago, Ill.

Turn Waste Space
And Spare Time
Into Big Profits

Recharging Batteries

offers garage men a bigger opportunity for profits than anything else they can do.

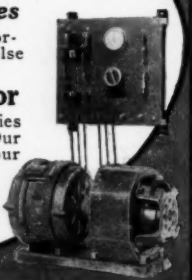
Our 3-G Motor Generator

charges from one to eight 6-volt batteries at one time. Anyone can operate it. Our 9-G Generator charges one to twenty-four batteries at a time.

There are over 8,000 of our vibrating type Battery Chargers in use. Write for particulars.

ST. LOUIS ELECTRICAL WORKS
4057 Forest Park Boulevard
St. Louis, Mo.

Ask For
Catalog No. 4.



DETROIT

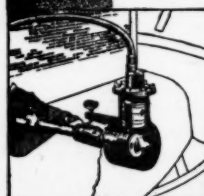
GEARLESS
CRANK-SHAFT
Tire Pump
Pat. Aug. 25, 1915

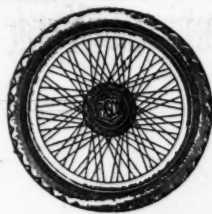
960,000 PROSPECTS
With Cars Between \$800 and \$1300

Now ready for Briscoe, Dodge, Chandler, Hudson, Overland, Reo, Hupmobile-R, and Studebaker cars. On and off in a jiffy without tools. Not a rubber diaphragm device. Write for details. Dealers, ask for discounts.

Price \$12

DETROIT ACCESSORIES CORPORATION
520 Hillger Avenue, Detroit, Michigan
Canadian Distributors
Walkerville Hardware Co., Walkerville, Ont.





PASCO WIRE WHEELS

Three exclusive patented features giving—1. A stronger web with more crossed spokes.

2. A more dependable Hub Cap—impossible to strain or break.
 3. A Safety Locking Device giving greater safety.
- Pasco Wire Wheels—mean strength, safety, economy and distinctive beauty.
To dealers they offer an unusual opportunity for profits.
Write for proposition.

NATIONAL WIRE WHEEL WORKS, Inc.
GENEVA, N. Y., U. S. A.

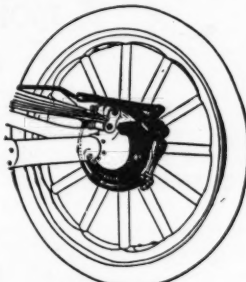
MR. DEALER

This morning's mail (July 1st) brought in repeat orders from dealers for 122 sets Pla-Safe Emergency Brakes. This is the best evidence in the world that our brake is a product of merit and is becoming one of the fastest selling Ford accessories on the market. Orders are coming in from all over the United States, as well as Australia, South America and Canada.

Price, \$10.00 per set

Write us today for our discount and big selling plan

The PLA-SAFE COMPANY
Successors to L. A. Leathers Co.
BROOKVILLE PENNSYLVANIA



Easy to install
No holes to drill

PETRY CUT OUT

Pat. 2-6-17



Sizes—1½" to 3¼"
Prices—\$4.00 to \$6.00

Gas expelled to the rear through patented flared opening, prevents all back pressure. Lever has seven adjustments, which make easy installation. Spring is away from the body of Cut-out, does not absorb heat, has a simple tension adjustment and easy action, no strain on the exhaust pipe.
Ends accurately machined for pipe size and fitted with set screw, which insures a permanently rigid installation.

N. A. Petry Company, Inc.
1309 Race Street Philadelphia

The "Big Stick" That Brings Down Gasoline Expense

Up goes the price of gasoline! Maximum mileage is the big problem of the day! Solve it with the new Stromberg Carburetor.



New STROMBERG Does it!
CARBURETOR

The Official world's records made by the New Stromberg in gasoline mileage prove that you need the New Stromberg on your car. Mail coupon for details of how the New Stromberg will reduce your gasoline bills.
Stromberg Motor Devices Co., Dept. 27, 64 East 25th St., Chicago

Delivery Problems Are Solved by *Standard* WORM DRIVE TRUCKS



2,
3½
and
5
TON

Prompt deliveries of all capacities. Quality, price and demand insure good business. Write for our proposition.
GOOD TERRITORY OPEN
STANDARD MOTOR TRUCK CO., Detroit, Michigan

RUSCO BRAKE LINING and CLUTCH DISCS

have for years been used as standard equipment by several large manufacturers of cars.
Is your car "Rusco" equipped?

THE RUSSELL MANUFACTURING CO.
MIDDLETOWN, CONN.
Detroit, Mich. New York City Chicago, Ill.



ON TRUCKS, to lengthen their "first life" without breakdown or interrupted service, these genuine oil-less bushings are installed.

BOUND BROOK & NIGRUM OIL-LESS BUSHINGS

TRADE MARK REG. U. S. PAT. OFF.

All Genuine Graphited Oil-less Bushings have always been made at Bound Brook, U. S. A.

BOUND BROOK OIL-LESS BEARING CO.

Specialists in the manufacture of Oil-less Bushings for more than a third of a century

Bound Brook, New Jersey



For Many Years the Best Seller



PIONEER Grease Gun

Built for Efficiency and Long Service. It is the oldest grease gun on the market and is still the most popular.



STEVENS & CO.
375 Broadway, N.Y.



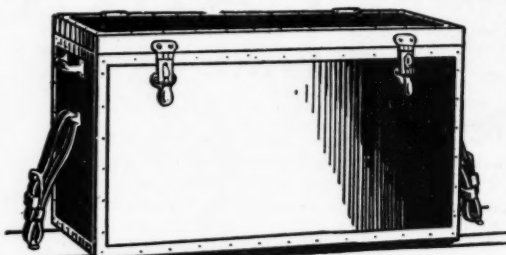
GUARANTEE VISIBLE PUMPS

Fast service, full measure and perfectly filtered gasoline, assure dealers the constant patronage of satisfied customers.

Write for the Pump Book

Guarantee Liquid Measure Company
Farmers Bank Bldg. PITTSBURGH, PA.

Economy Auto Lunch 1918 REFRIGERATOR



THIS BOX CONTAINS RELIABLE MEANS OF RETAINING FOODS OR DRINKS, WARM OR COLD, AS DESIRED
NO Outing Complete Without it. *Write for Folder.*

TRAVERSE CITY REFRIGERATOR CO., Traverse City, Mich.



**ANY DEALER
Can Make
Money on the**

GASCO

Everybody wants to save money on gasoline bills. The Gasco costs only \$1 and will do this for them. We stand behind all we claim for Gasco with a money back guarantee, so you can't lose. Fits between the intake and carburetor flanges like a gasket. Write today for our proposition.

Don't miss it.

GASKET SUPPLY COMPANY
1727 Ludlow St., Philadelphia, Pa.

155 motor car builders and motor truck builders use
ECLIPSE
BENDIX DRIVE
as standard equipment

AN
AUTOMATIC
GEAR
TRANSMISSION
for
ELECTRIC
STARTERS

Manufactured by
ECLIPSE MACHINE CO
Elmira, N.Y.

CENTURY

CRYSTALLIZED PLATE
STORAGE BATTERY

Century batteries are built and sold for replacement only. They are standardized batteries with Universal Terminals. 6-V. 80-Amp. (square), 6-V. 80-Amp. (long), 12-V. 40-Amp. Just 3!! Think of it! Three! They replace 51 shapes and sizes and combinations of other makes of batteries and make 95% of all replacements.

Universal Terminals means easy service.
Standardizing means cheaper manufacturing.

Write us for particulars and territory

CENTURY STORAGE BATTERY COMPANY
DETROIT, U. S. A.

GOOD TIRES AT CUT RATE PRICES

High grade, firsts—not seconds, not blemished or rejected tires, but good tires; tires that will bring every user back for more. Sold without guarantee. Are not these prices the biggest bargains you ever purchased in your life—Think of it!

PRICES TO DEALERS:

	Non-Skid	Tubes		Non-Skid	Tubes
30x2.....	\$ 9.50	\$2.15	32x4.....	\$18.95	\$3.50
30x3 1/2.....	12.00	2.50	33x4.....	20.20	3.00
32x3 1/2.....	14.35	2.60	34x4.....	21.00	3.70

Write now for dealers' proposition, or better yet, rush in a trial order with Chicago or New York draft, express or P. O. money order. If you prefer, send 20% of amount with your order and we'll ship goods C. O. D., subject to examination. Investigate this now. Let us tell you how we can do it.

BUDRICK RUBBER CO.

Dept. A, 36 S. State St., Chicago



ZENITH CARBURETOR

KNOWN the world over as the zenith of carburetor efficiency. A long list of American builders of cars, trucks and aeroplanes believe this simple, plain tube device to be the best insurance for permanent carburetor satisfaction.

Zenith Carburetor Co.
New York Detroit, U.S.A. Chicago

BENFORD'S GOLDEN GIANT

"SIMPLY SHOW
THE GOLDEN
GIANT"

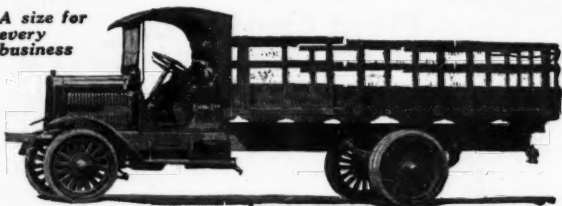
"IT SELLS
ON SIGHT"

BENFORD
MFG. CO.

MT. VERNON,
N. Y.

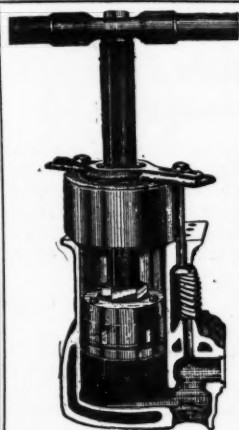


A size for
every
business



Incomparable engine ability, axles, springs, brakes and frame of the best material, and, above all, unexcelled workmanship, characterize Kissel Trucks.

See your nearest Kissel Dealer today
Kissel Motor Car Company, Hartford, Wis., U. S. A.



Make More Profit Storm Reboring Machine

by using

The most practical machine for any type of motor. SIMPLE, SPEEDY, ACCURATE and RELIABLE for hand or power. No shop complete without one. In daily use in all parts of U. S. A. and foreign countries. Shortage of new cars makes it indispensable in large and small shops.

We furnish machines of varied capacities from 2½-in. up. Also special Ford Machine. For sale by leading jobbers. Overize pistons for all makes of motors.

For further information write to

Storm Manufacturing Company
Box 226 THOMPSON, IOWA

When Rear Axles Throw Grease Onto Brakes

You get a skidding action from unequal braking influence. You can easily avoid this annoyance by lubricating differentials with



It will not throw from the casing, but gives perfect lubrication until entirely used up.

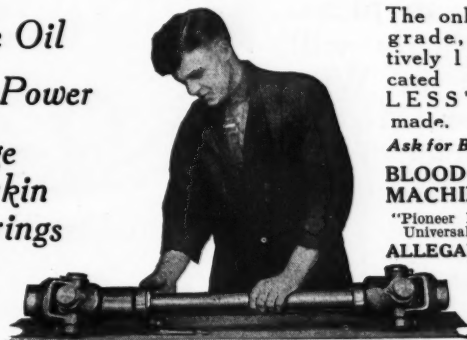
You will find it worth while to use NON-FLUID OIL on other parts of your car. It stays in bearings, keeps them well lubricated and actually costs less per month for better lubrication.

Use "K00" Special grade for oil tight differentials and transmission; "K000" for bearings and differentials that are not oil tight

New York & New Jersey Lubricant Company
165 Broadway, New York

Blood Bros. Universal Joints

Save Oil
Save Power
Large
Workin
Bearings



The only high grade, positively lubricated "CAN-LESS" joint made.

Ask for Booklet E
BLOOD BROS.
MACHINE CO.
"Pioneer Makers of
Universal Joints"
ALLEGAN, MICH.

Guaranteed for 10,000 Miles Bricton Pneumatic Tires

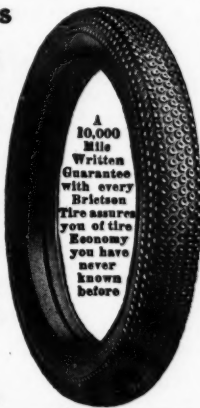
Every Bricton Tire is sold under a specific 10,000 mile written service guarantee. This guarantee is the longest and strongest ever put behind a pneumatic tire and is a positive protection to every purchaser. Bricton Tires are Puncture-Proof, and proof against blowouts, skidding, ruts, rim-cuts, oil and gasoline. Wonderful resiliency, easy riding qualities and economy commend them to every car owner.

Retread Your Present Tires—If your present tires are new, or if your tires have been used and the rubber tread has been worn off or thin, protect them with Bricton Treads and get greater service out of your tires and also make them puncture proof, oil proof, rut proof, gasoline proof and non-skid.

FREE TRIAL OFFER—To convince you Bricton Tires will give you satisfaction you may try them on your car at our expense. Write today for this Free Trial Offer, a copy of our guarantee and full information about Bricton Tires and Treads.

THE BRICTON MFG. CO.

1015 to 24 Woodmen of World Building
Dept. 1278 OMAHA, NEBRASKA



ELECTRIC STARTING & LIGHTING SYSTEM for FORD Cars

The way absolute dependability has been achieved in this system is by building over 95 per cent of it in our own plant, where we can watch every operation and know it is right.

\$95.00 Completely Installed

DISCO ELECTRIC MANUFACTURING CO.
DETROIT

Presto Specialties

Cataloged and Sold by
Leading Jobbers and Dealers
Demanded by Car Owners Everywhere
Know the Presto Line

METAL SPECIALTIES MFG. COMPANY

338-352 N. Kedzie Avenue CHICAGO

Eastern Branch 1621 W. 61st St. New York City

Western Branch 149 New Montgomery St. San Francisco Cal.

ECONOMIZE

MAKE YOUR OLD TIRES GO TO WORK AGAIN

Send along your old casings. From two old tires, by our special double-tread process, we will turn you out one tire ready for the road.

It makes no difference whether they are sand-blistered, punctured, rim cut or blown out.

McDANIEL WILL REJUVENATE THEM!

Tires received are examined and repaired by experts, the weaker one is telescoped over the stronger, the bead removed and locked firmly in place by the Special McDaniel Double Tread Process which adds new service.

LEO McDANIEL RUBBER CO.
884 Commercial Avenue, Cairo, Ill.

SIZE	If You furnish 2	If You furnish 1	If You furnish Both	Special Gray
30x22	\$3.25	\$5.00	\$6.75	\$1.90
30x34	4.00	6.00	7.25	2.40
32x34	4.25	7.25	9.00	2.55
32x4	4.50	7.75	9.50	3.10
32x4	4.75	8.00	10.00	3.20
32x4	5.25	8.25	10.25	3.30
34x4	5.50	8.50	10.50	3.40
36x4	5.75	8.75	11.00	3.50
34x4 1/2	5.75	9.00	11.50	4.10
36x4 1/2	5.75	9.25	12.00	4.25
36x4 1/2	6.00	9.50	12.50	4.35
36x5	6.25	10.50	13.50	5.00
37x5	6.50	11.50	15.00	5.40

The DEFENDER



Sells for \$4.00
Worth the price of car

Is the "Standard" Ford Ignition Lock. Always demand the Defender, and take no imitations. The Defender safely locks the coil-box, and is the only lock that grounds the electrical system; this makes them thief-proof.

INSURANCE COMPANIES REQUIRE THE DEFENDER
AND ALLOW 15 PER CENT OFF ON INSURANCE

DEFENDER AUTO LOCK CO.
DETROIT, MICHIGAN

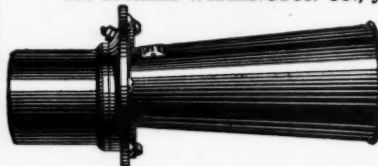
DEALERS
in pleasure cars will find in Winther Motor Trucks, "Unquestionably America's Foremost Quality Truck"—an addition to their line which will put profits back where they belong.



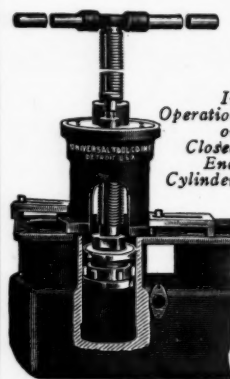
SPARTON PRODUCTS

First Choice of America's Best Cars

Sparton Motor-Horns—Hand-Operated and Motor-Driven. Sparton Gasoline Vacuum Systems, Sparton Honeycomb Radiators and Sparton Radiator Fans
The SPARKS-WITHINGTON CO., Jackson, Mich., U. S. A.



Pacific Coast Representative
NORMAN COWAN CO.
San Francisco Calif.



The New Improved Universal Cylinder Reboring Tool
Is Mistake Proof

As simple in design as it is effective in action. Construction insures an absolutely rigid tool, with perfect centering device. Other new and revolutionary improvements that make cylinder reboring easy for any one to do.

Range of Expansion $2\frac{1}{2}$ "-5 $\frac{1}{16}$ "

Write for free illustrated literature with complete details. Give Jobber's name.

THE UNIVERSAL TOOL CO., Inc.
DETROIT 918 Beaubien St. MICHIGAN

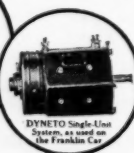


STARTING-LIGHTING SYSTEMS

THE DYNETO shows greatest efficiency in both motor and generator. Type D. A. Motor develops a torque of approximately 15 pounds. Type C. A. Generator shows approximately 15 amperes. A car-speed of 15 to 20 M. P. H. keeps batteries fully charged. Starter always sure to start. Lamps always bright. Send drawings and specifications for our recommendation.

Special Outfits for Fords

DYNETO ELECTRIC CORPORATION, Syracuse, N. Y.



Steel Tires & Mud Chains



Old Tires Covered Complete

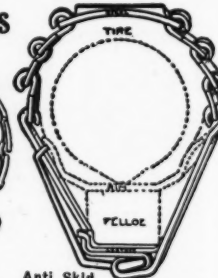


NO MORE PUNCTURES

Try 2 or 3 sections over any old blowout. Can't have blowouts, punctures; neither can the rubber wear off.

Special Prices to Those in New Territory

Kimball Tire Case Co., 173 Broadway Council Bluffs, Ia.



Anti Skid

Mud chains can be put on in a jiffy with one hand while standing on the running board. Hook the ends together and push the little lever. If you get in a mud hole you will laugh out loud.

A 1-INCH FIRING SURFACE

Greater Power

Quicker Acceleration

Less Carbon

BERGIE National SPARK PLUGS

10% to 20% More Mileage

Price \$1 Each

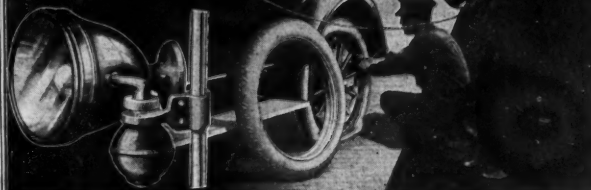
Dealers Write

BERGIE NATIONAL SPARK PLUG CO., Rockford, Ill.

ANDERSON AUTOREEELITE

MAKES TIRE CHANGING AS EASY BY NIGHT AS BY DAY

More than just a Spotlight.



ANDERSON ELECTRIC SPECIALTY CO.
118-124 S. Clinton St. Chicago, Ill.

Good roads everywhere—
for him who uses



Hartford
SHOCK ABSORBER
No jolts! No
jars! No vi-
bration!
Just solid com-
fort and longer
car life.

Edward V. Hartford, Inc.
146 Morgan Street
JERSEY CITY, N. J.

"SOLID COMFORT"



The Sign of Service

BALL BEARINGS PROPERLY REGROUND

have all the qualities of new
bearings—but they are cheaper.

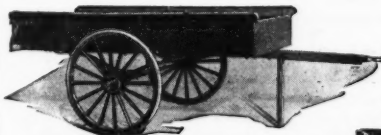
Distributors of Hess-Bright new bearings. Com-
plete stock of all types of ball bearings.

CONRAD PATENT LICENSEE
See our nearest branch

AHLBERG BEARING COMPANY
2636 Michigan Ave. CHICAGO

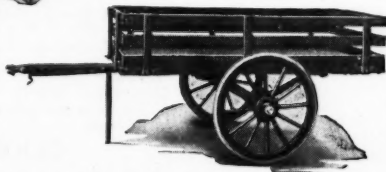
New York, Boston, San Francisco, Detroit, Minneapolis, Los Angeles,
Cleveland, Atlanta, Portland, St. Louis, Philadelphia

Jackson Auto Trailers



Built by men who are
pioneers in the in-
dustry, of the best
materials obtainable,
and sold at a price
that is right.

Built in six different
models, a size for
every load and car.
Write us for our deal-
er's proposition and
complete information.



THE MILES MFG. CO. DEPT. 10 Jackson, Mich.

MODEL 302 Price \$25.00



This Is Our STANDARD Garage Test Set

Easy to understand and oper-
ate. It enables your mechanic
to stop guessing and to locate
all troubles quickly.

Dodge Bros., Buick, Cadillac,
Hudson, Cole, Overland, Nash,
Chalmers, King, Chevrolet
and Delco Light have used
thousands of them.

WRITE TODAY FOR FREE CATALOGUE COVERING OUR LINE
OF INSTRUMENTS AND PUBLICATIONS

PHILLIPS ENGINEERING CO., Dayton, Ohio

"EASY ON"
SEAT COVERS
TIRE COVERS
TOP RECOVERINGS

GORDON
EASY-ON SEAT COVERS
TIRE COVERS
TOP RECOVERINGS

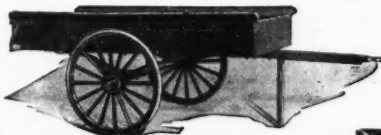
WE HAVE
PATTERNS FOR
MORE THAN A
THOUSAND MODELS
OF CARS.

Sold by leading Jobbers and Dealers everywhere
Write for Sample Book and Price List

The J. P. GORDON CO.
308 North Fourth St. Columbus, Ohio.

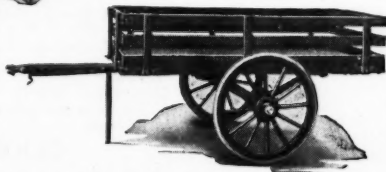


Jackson Auto Trailers

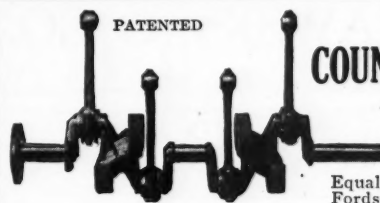


Built by men who are
pioneers in the in-
dustry, of the best
materials obtainable,
and sold at a price
that is right.

Built in six different
models, a size for
every load and car.
Write us for our deal-
er's proposition and
complete information.



THE MILES MFG. CO. DEPT. 10 Jackson, Mich.



PATENTED

DUNN'S COUNTER BALANCES Make Ford Motors Run Smooth

Equally necessary on Racing
Fords, passenger models, deliv-
ery cars and tractors. They add
enough to life of the motor to pay for themselves quick. They posi-
tively give more speed, more power, greater economy. More than
1000 Fords are now equipped, and every user satisfied. More than
half of the orders received are repeat orders, coming from those
who have tried them and know. Installed with a wrench.

Big Ready Sellers. Price \$12.00 per Set

Liberal Discount for Dealers and Jobbers

Write for our proposition and free illustrated literature

DUNN COUNTERBALANCE CO., Motor Dept. Clarinda, Ia.

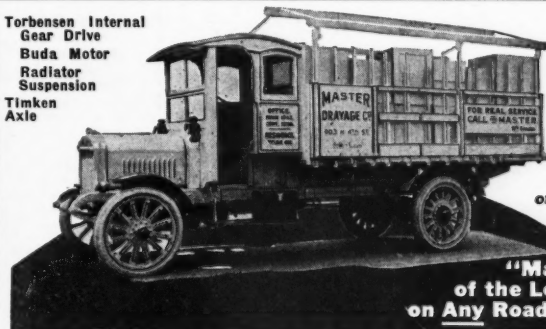
Dunn Counterbalance Sales Co., of California
1220 San Pedro Street Los Angeles, Cal.

BOSCH AMERICA'S SUPREME IGNITION SYSTEM



NEW YORK, CHICAGO, DETROIT, SAN FRANCISCO
WORKS AND FOUNDRIES, SPRINGFIELD, MASS.

Torbensen Internal
Gear Drive
Buda Motor
Radiator
Suspension
Timken
Axle



Catalogue
on Request

"Master
of the Load
on Any Road"

Master
Trucks, Inc.
3137 Wabash
Ave., Chicago

MASTER
TWO-TON TRUCK

Chassis
\$2190
F. O. B. Chgo.
and War Tax

THE CLEARING HOUSE

OF THE MOTOR INDUSTRY

FOR PARTS, ACCESSORIES, TIRES, MACHINERY, REBUILDING, REPAIRING, WELDING AND USED CARS.
ALSO HELP AND SITUATIONS WANTED AND MISCELLANEOUS CLASSIFIED ADVERTISING

Rapid Fire Service and Lowest Prices ON GOOD SERVICEABLE PARTS FOR ALL CARS

If We Cannot Satisfy You, Money Cheerfully Refunded

SPECIAL MOTOR BARGAINS

All in excellent condition

4 cyl. 1914 Mitchell.....	\$100.00
4 cyl. 1913 Big Mitchell.....	100.00
4 cyl. 1914 Mitchell starter and generator.....	125.00
1914 Oldsmobile (Defender model).....	100.00
4 cyl. Oldsmobile (Autoerat model).....	150.00
6 cyl. Thomas Motor (cast in pairs).....	125.00
1911 Packard.....	100.00
1912 36 Pierce Arrow.....	125.00
New Marion Motor.....	100.00
4 cyl. 1914 Moon with starter.....	100.00
4 cyl. 1913 Buda.....	85.00
1913 Atlas.....	75.00
6 cyl. 50 H. P. Rider-Lewis (fine for boat).....	100.00
1914 Marmon.....	100.00
1915 Kirt.....	65.00
83 Overland with starter.....	85.00
6 cyl. 1914 Jeffery with starter and generator.....	125.00
6 cyl. Everitt.....	85.00

UNIT POWER PLANTS

4 cyl. Continental—complete.....	\$100.00
4 cyl. Milwaukee—complete.....	100.00
1914 Lozier 6.....	200.00
1914 Premier with starter.....	150.00
4 cyl. Chalmers 30.....	65.00
6 cyl. Stevens-Duryea—complete.....	150.00
4 cyl. 1913 Abbott-Detroit with starter and generator.....	150.00

1914 Allen.....	\$115.00
1917 6 cyl. Regal.....	100.00
1915 6 cyl. Master Chalmers.....	150.00
1916 6 cyl. Chalmers 30.....	125.00
1914 6 cyl. Cole.....	135.00
1914 6 cyl. Oldsmobile.....	135.00
Buick 35.....	100.00
1916 Le Roi.....	65.00
Hupp 20.....	40.00

Liberal allowance made on your old motor

Cylinder Blocks, Pistons, Shafts, etc., for most all motors

MAGNETOS

Overhauled and Guaranteed

DU4 Bosch Set Spark.....	\$18.00
DU4 Bosch Variable Spark.....	22.50
DU6 Bosch.....	27.50
DR4 Bosch.....	18.00
DR6 Bosch.....	22.50
D4 Bosch.....	15.00
D6 Bosch.....	17.50
NU4 Bosch.....	15.00
ZR6 Bosch.....	35.00
Eisemann Dual.....	15.00
Remy Model RL & D.....	7.00
Dixie Mags.....	12.00

We carry in stock all magneto parts

GENERATORS

Gray & Davis.....	\$15.00
Ward Leonard.....	12.00
Remy.....	18.00
Vesta.....	12.00
Beardon.....	12.00
Apple.....	10.00

300 new Adjustable T Bumpers, nickel or black, fit all cars except Fords.....\$4.50 each
14,000 ft. new radiator hose, price per ft., 1-in., 20c; 1 1/4-in., 25c; 1 1/2-in., 30c

Mail Orders Shipped Same Day

WARSHAWSKY & CO., Largest Car Wreckers in the West

Phone Calumet 7315

Highest Prices Paid for Wrecked Cars

1915 S. State St., CHICAGO, ILL.

STARTERS

Gray & Davis.....	\$15.00 to \$20.00
Remy.....	15.00
Ward-Leonard.....	20.00
Auto Lite, Bendix Drive.....	25.00
Auto Lite, Gear Drive.....	20.00
Wagner.....	25.00
Westinghouse.....	25.00
Delco.....	25.00

COILS

Bosch Type A.....	\$7.00
Eisemann.....	4.00
Splitdorf.....	4.00
Simms, H. T.....	12.00
Mea.....	10.00

Silent Starter and Generator Chains; all lengths and sizes.

NEW HEADLIGHTS

Gray & Davis 12-in. face, two bulb type.....	\$5.00
Special 12-in. face, two bulb type.....	4.00
New steering posts.....	5.00

SECOND-HAND CAR DEPT.

\$150.00 to \$550.00

50 to 75 exceptionally good used cars at prices so low that they would even interest dealers.

PREST-O-LITE TANKS

B-Presto Tanks.....	\$5.00
E-Presto Tanks.....	4.00
Searchlight.....	3.00

SPEEDOMETER HEADS

Stewart or Warner.....	\$1.50 to \$4.00
------------------------	------------------

RIMS

All Styles and Makes

Stanweld.....	\$2.50
Funk.....	2.00
Reversible Firestone.....	2.00
Continental.....	2.50
All other makes.....	1.50

TIRES AND TUBES

We wreck many cars every day and thus obtain great quantities of exceptionally good Tires and Tubes at prices that will interest you.

New Steering Posts.....	\$5.00
Front Axles.....	\$5.00 to \$10.00
Rear Axles.....	15.00 to 40.00
Radiators.....	13.00 to 35.00
Transmissions.....	15.00 to 100.00
Carburetors.....	5.00 to 9.00
Bearings.....	.50 to 3.50
Springs.....	1.00 to 3.50
Transmission Gears.....	1.00 to 5.00
Differential Gears.....	5.00 to 10.00
Axle Shafts.....	2.00 to 8.00
Gasoline Tanks.....	1.00 to 5.00
Lamps.....	.50c to 5.00
Windshields.....	3.50 to 8.00
Spotlights.....	3.50
Stewart Vacuum Tanks.....	4.00
Carter Tanks.....	2.50

Our New Bargain List—Order Now

PLAY SAFE!

You lose nothing through caution.

We guarantee every part to be exactly as represented or we will refund your money.

Highest Banking
References

MOTORS

R. C. H.....	\$ 40.00
Flanders 20.....	50.00
E. M. F.....	50.00
Studebaker 25.....	50.00
Studebaker 4-15.....	75.00
Overland 56.....	75.00
Overland 69.....	75.00
Overland 6, Continental.....	100.00
Peerless 45 H. P.....	50.00
Partin Palmer.....	50.00
Firestone Columbus.....	60.00
Mitchell 4-40.....	75.00
Stoddard Dayton 30.....	60.00
Stoddard Dayton 45.....	75.00
Case 1911.....	75.00
Cadillac 1911.....	75.00
Cadillac 1912.....	75.00
Kissell 40.....	75.00
American 30.....	75.00
Moon 1912.....	75.00
Stearns 1911.....	75.00
Henderson 4 cyl.....	75.00
Buick 19.....	85.00
Locomobile 1910.....	90.00
Chalmers 6, 1915.....	100.00
Apperson 8 cyl.....	100.00
Packard 6-48, 1914, with Starter, Generator and Bosch Magneto.....	300.00

UNIT PLANTS

Haynes, 1910, Unit Plant.....	\$ 75.00
Chalmers model 17.....	100.00
Menominee Truck.....	100.00
King 1914.....	100.00
Auburn 1914.....	100.00
Elcar 1916.....	125.00
Allen 1916.....	125.00
Paige 6, 1917.....	200.00

STARTERS

Gray & Davis, Maxwell.....	\$17.50
Remy, Mitchell 4-6.....	15.00
Ward Leonard.....	15.00
Auto Lite.....	12.50
Wagner.....	20.00
Bosch Fly Wheel Type.....	25.00
S-202, less fly wheel ring gear; Jesco 16-volt.....	20.00

GENERATORS

Auto Lite.....	\$17.50
Gray & Davis.....	20.00
Ward Leonard.....	15.00
Vesta.....	12.50
Beardon.....	12.50
Apple.....	12.50
Eskridge.....	12.50

MAGNETOS

Splitdorf Dixie.....	\$20.00
Mea.....	25.00
Bosch D-4.....	17.50
Bosch N-U-4.....	20.00
Bosch D-R-4.....	25.00
Bosch D-U-4.....	30.00
Bosch D-6.....	25.00
Bosch D-R-6.....	35.00
Bosch Z-R-6 and coil.....	50.00
Bosch Z-R-4 Dbl. Distb.....	125.00

PARTS

Rear Axles.....	\$25.00 to \$50.00
Front Axles.....	5.00 to 15.00
Radiators.....	10.00 to 20.00
Transmissions.....	25.00 to 50.00
Bearings.....	.50 to 5.00
Springs.....	1.50 & 2.50
Spring Leaves.....	.25 & .50
Gears.....	1.50 to 15.00
Axle Shafts.....	2.00 to 10.00

13th and Oak
Kansas City, Mo.

AUTO WRECKING CO.

When Writing to Advertisers, Please Mention Motor Age

Parts and Repairs.

MOTORISTS

Do Your Bit

Make the Old Car
Do Another Year

Help the Government save material, making the old car do another year. Puritan Auto Parts and Supplies will make the old car run like new. We have a complete stock of, and can make immediate delivery on

Axle, Motor, and Transmission parts, Pinions, Pistons, Steering Gears, Universal Joints, Clutch Parts, Radiators, Fenders, Tops, Bodies, Wheels, Rims, Windshields, etc., etc.

SPRINGS

All sizes for all cars, up.....\$3.00

WHEELS AND RIMS

For all cars, up.....\$ 3.00
Houck wire wheels, 34x4½, 36x4½, per set of five wheels..... 75.00
Front wheels for Fords..... .75

BATTERIES

6-volt, 100-hour Exide Storage Batteries..\$18.50
6-volt, 100-hour Century Storage Batteries 20.00
Battery boxes, up..... 1.00

RADIATORS

For all cars—Buick, Studebaker, Overland, Chevrolet, etc. Write for prices.

TIRES

Large assortment of standard size tires

30x3, Smooth tread.....\$10.00
30x3½ Non-Skid..... 14.50
31x4, Non-Skid..... 20.00
32x3½, Non-Skid..... 14.95
33x4, Non-Skid..... 21.70
34x4, Non-Skid..... 21.95

No mileage guarantee at these prices

Write for a copy of our free Bargain Bulletin

Puritan Machine Co.

"All Parts for All Cars"

410 Lafayette Blvd. Detroit, Mich.

IMMEDIATE
ATTENTION

TO ALL ORDERS

NEW

Gears, Shafts and Bearings for over 600 models at great saving.

DEMAND

for our Double Tread Tires

PROVE

their serviceable qualities, especially adapted for hard country driving.

NOTE THESE VALUES

28x3.....\$4.15	33x4.....\$ 7.80
30x3..... 4.75	34x4..... 8.00
30x3½..... 5.80	34x4½..... 9.65
32x3½..... 6.75	35x4½..... 10.15
31x4..... 6.95	36x4½..... 10.40
32x4..... 7.45	37x5..... 11.50

10% More for Non-Skid

One dollar deposit required with each tire ordered. Shipments made promptly with privilege of examination. No mileage guarantee at above prices.

AUTO NECESSITIES CO.

4948 Sheridan Rd. Chicago, Ill.

Parts and Repairs.

SAVE
TIME & MONEY

Send us your order now

GEARS BEARINGS SHAFTS

for over 600 models—Quality Guaranteed

Extraordinary savings in used and demonstrating tires and tubes.

Serviceable Double Tread Tires	New Tubes	Used & Demonstrating Tires	Used Tubes
28x3.....\$ 4.15	\$1.85	\$3.50	\$1.25
30x3..... 4.75	2.00	4.00	1.35
30x3½..... 5.80	2.45	4.90	1.45
32x3½..... 6.75	2.65	5.75	1.50
31x4..... 6.95	2.80	6.75	1.65
32x4..... 7.15	2.90	7.00	1.60
33x4..... 7.80	3.35	7.75	1.70
34x4..... 8.00	3.50	8.25	1.70
33x4½..... 9.25	4.00	8.50	1.70
34x4½..... 9.65	3.80	8.50	1.75
35x4½..... 10.15	4.00	9.25	1.80
36x4½..... 10.40	3.50	9.25	1.85
35x5..... 11.40	4.00	10.00	2.00
37x5..... 11.50	4.00	11.00	2.10

Ten Per Cent More for Non-Skid

Although at the above prices we are unable to give a mileage guarantee, we will, in all cases where reasonable service has not been received make suitable adjustment in order to hold your patronage.

Full line of standard brand new seconds and firsts sold always at a great saving.

WRITE US YOUR NEEDS

One dollar deposit required with each tire ordered. Shipments made promptly subject to your inspection.

AUTO NEEDS COMPANY

1602 So. Michigan Avenue
CHICAGO ILLINOISWICHITA AUTO
RECKING CO

805-809 W. Douglas St.

EXCEPTIONAL VALUES IN MOTORS

Auburn 40.....	\$ 75.00
Buick 26.....	50.00
Buick 17.....	70.00
E. M. F.....	40.00
Flanders.....	50.00
Overland 69.....	50.00
Overland 38.....	40.00
Overland 71.....	75.00
R. C. H.....	50.00
Reo (5th).....	100.00
Studebaker 25.....	60.00
Vellie 40.....	75.00

UNIT POWER PLANTS

Buick 31.....	\$100.00
Buick 37.....	125.00
Chalmers 36.....	100.00

SPECIAL

WINTON SIX (Bosch Mag.).....\$200.00
AND MANY OTHERS!

PARTS FOR FOLLOWING CARS:

Auburn 30-40, Buick F-10-16-17-19-28-29-30-31, Burg 40, J. I. Case 40, Carter-Car F-A-L-R, Chalmers F-K-L-Six-10-11-M, Clark 40, Cadillac 1909-1910, Cameron, Detroit, E. M. F. 30, Enger 40, Flanders 2 & 3 speed, Fal Car, Fuller, Ford N-R-S (only), Great Northern, Halladay 40, Haines 1910, Hupp 20, Hudson 20, I. H. C. 2 & 4 cylinder, Jackson 2 & 4 cyl. 45—Olympic & Majestic, Krit, Kissel Kar, Knox 40, Lambert 2 & 4 cylinder, Lexington 40, Marathon 30-40, Marmon, Maxwell 2 & 4 cyl. K-Q, McFarland Six, Mitchell 40, Moon 40, Mason "May Tag" 4 cyl., Michigan 40, Monarch 40, Metz, Ohio, Overland 30-32-35-38-41-42-52-59-69-79-83, Oldsmobile 40, Oakland 2 & 4 cylinder, Paige Detroit—Roadster, Premier, Regal 30, Rambler 34-40-53, Reo 2 & 4 cylinder—5th, R. C. H., Rider Lewis, Sellers, Stoddard Dayton, Studebaker, Vellie 30-40, Winton.

And many other cars that these parts are interchangeable with

In ordering Gears and Bearings, it would be well to send in the old parts when convenient; or any numbers which might be on them.

We have on hand, at the present time, 20 different models of Motors from 20 to 40 H. P. Money will be refunded on any parts, if for any reason they cannot be used, if returned within ten days.

Send to Wichita, Kansas, for Parts

When Writing to Advertisers, Please Mention Motor Age

Parts and Repairs.

LOZIER
REPAIRS

All orders for Lozier replacement parts are now being filled from our plant at Detroit—and nowhere else. We have discontinued all branch repair stations. In the future, all service correspondence and orders must be forwarded direct to us, as we do not guarantee the quality or accuracy of repairs purchased in any other way.

LOZIER MOTOR CO.

Detroit

Michigan

Parts 50 to 80% off List

Allen American	Henry Hupp	Overland Packard
Apperson Auburn	I. H. C. Inter-State	Paige Paige Detroit
Brush Buick	International Jackson	Parry Pathfinder
Cadillac Carnation	Kissel-Kar Knox	Peerless Pilot
Carter Car Case	Krit Leader	Pierce Arrow
Chalmers Clark	Lexington Little	Premier R. C. H.
Cole Columbia	Lyons-Knight Lozier	Rambler Reo
Continental Cutting	Locomobile McFarlan	Richmond Sampson
Davis Detamble	Marion Matheson	Silent Knight Speedwell
Elmore E. M. F.	Maxwell Mitchell	Stearns Stoddard
Everitt Flanders	Nyberg National	Studebaker Thomas
Great Wes. Haynes	Oakland Oldsmobile	Waverly Wayne
Hudson	Overland	Wescott Winton
		Zipp

Main 1579

619 N. Illinois St.

New 22-063

I. WOLF AUTO PARTS & TIRE CO.
INDIANAPOLIS, IND.

NEW BODY BARGAINS

for Pleasure and Commercial Cars

4-pass, Chummy, 106 in. long with top...\$100.00
5-pass. Touring, 93 or 97 in. long with top..... 100.00
Pathfinder touring, 135 in. wheelbase..... 100.00
Racing seats with spring cushions, pair.. 12.75
18 in. steering wheels, shopworn..... 1.50
Chalmers windshields, for One-Man Top.. 10.00
¾ in. Copper tubing, about 10 ft. lengths, pound..... .65
2, 4, 6, 12 cylinder Motors, for trucks or boats, up..... 35.00
1 cyl. High Tension Magnetos..... 6.00
Repairs for Drexel & Abbott Cars. Gears and Shafts for all cars

AUTO AUCTION COMPANY

517-19 Jackson Blvd.

CHICAGO

ILLINOIS

RIMS ALL MAKES RIMS

WHEELS REBUILT AND REPAIRED

COMPLETE CATALOG FOR DEALERS

CHICAGO WHEEL AND RIM CO.
2010-12 Wabash Avenue Chicago, Ill.

Parts and Repairs.

Parts and Repairs.

Parts and Repairs.

PARTS FOR ALL CARS

We Save You 50 to 80% of the Original Cost

MAGNETOS	
Bosch DU Set spark.....	\$16.50
Bosch DU4 & 6 Variable.....	20.00
Bosch DR4	16.50
Bosch DR6	20.00
Bosch D4	12.00
Bosch D6	15.00
Bosch ZR6 with coil.....	35.00
Eisemann	10.00
Remy	7.00
Dixie	10.00
Coils, Generators and Starters. Silent Starter and Generator Chains, all lengths and sizes.	

Lighting and Starting Batteries, \$6.00 to \$15.00	Springs
Carburetors	Transmission
Front Axles	Gears
Rear Axles	Differential Gears
Transmissions	Rims
Axle Shafts	

Pistons, Cylinder Blocks,, Crank and Camshafts, Radiators, etc.
Many good motors in stock.
Tell us your needs

In wrecking cars we obtain and always have for sale a complete stock of parts for all makes of cars. Also tires and tubes whereby we can save you from 50 to 80 per cent

OUR SLIGHTLY USED TIRES AND TUBES

MEAN ECONOMY TO MOTORISTS :: A TRIAL WILL CONVINCE YOU

Size	Tires	Tubes	Size	Tires	Tubes	Size	Tires	Tubes
30x3.....	\$4.00	\$1.35	32x4.....	\$7.00	\$1.60	35x4 1/2.....	\$8.50	\$1.80
30x3 1/2.....	5.00	1.45	33x4.....	7.75	1.70	36x4 1/2.....	8.75	1.85
31x3 1/2.....	5.25	1.50	34x4.....	7.75	1.70	37x4 1/2.....	9.25	1.90
32x3 1/2.....	5.50	1.50	35x4.....	8.00	1.75	35x5.....	9.50	2.00
34x3 1/2.....	6.00	1.60	36x4.....	8.00	1.75	36x5.....	9.50	2.00
31x4.....	6.25	1.65	34x4 1/2.....	8.25	1.75	37x5.....	10.00	2.20

SPECIAL—Four 41x5 Tires, Rims and Tubes, \$80.00

PROMPT ATTENTION TO MAIL ORDERS

No Mileage Guarantee on Used Tires

Deposit Required with All Orders

MOTOR SALVAGE CO., 1425 State St., Chicago, Ill.

BUY YOUR USED PARTS FROM THE LARGEST
USED PARTS CONCERN IN NEW YORK STATE

50 to 80% Off List Price

Crank Cases\$10 to \$75 } Cylinder Blocks\$ 5 to \$40
Crank Shafts 5 to 35 } Radiators 10 to 40

Gears — Bearings — Springs

Our stock of the above parts is practically complete. Lamps, Tires, Carburetors, Magnetos, Coils, Wheels, Rear Axles, Motors. Anything for the automobile.

Money refunded if goods are unsatisfactory

ROCHESTER AUTO PARTS, INC., 135 Culver Rd., ROCHESTER, N. Y.

PULLMAN NEW PARTS FOR PULLMAN CARS
OWNERS ATTENTION! A Complete Line of All Parts AT A GREATER SAVING!
ATTENTION! We Undersell Them All!
PULLMAN AUTO PARTS & SERVICE COMPANY
Dept. "P," 115 East 18th St. Kansas City, Missouri

Detroit and Briggs-Detroit Motor Car Owners Notice

During the past several months, owing to financial difficulties of the former management, there has been considerable confusion as to where Detroit and Briggs-Detroit repair orders should be sent.

With our acquisition of the Detroit Motor Car Company, however, this condition is entirely overcome, and in the future all Detroit and Briggs-Detroit Service will be given direct from our factory at Detroit.

Therefore, to insure prompt attention and handling, repair orders and correspondence must be addressed (as before) to

DETROITER MOTOR CAR CO.
584 Franklin St. Detroit, Mich.

•PARTS IN STOCK

For Immediate Delivery

FOR OVER 35 MAKES OF CARS

Magnetos	\$ 8.00 to \$30.00
Starters or Generators.....	10.00 to 25.00
Presto Tanks, Model B.....	\$5.00; E, \$4.00
Transmission Gears	\$ 1.00 to \$ 5.00
Differential Gears	4.00 to 10.00
Rear Ends, complete.....	15.00 to 35.00
Rims	1.50 to 2.50

New Motor-Driven Air Pumps for Dodge and Buick cars, Special.....\$3.50
Good Used Tires and Tubes at Low Prices
Write Us Your Needs

L. & R. AUTO DEALERS & PARTS CO.
3210 W. Jackson Blvd. Chicago, Ill.

PARTS FOR ALL CARS

50% to 80% off Mfrs. List Price. First class used parts. Large stock of parts for White and Keaton cars. Motors: Regal, \$50; Metz, \$65; Buick 4, \$90; Waukesha, \$125. Presto Tanks, \$4 to \$5. Bosch H. T. Magnetos, \$25. Gray & Davis Starter and Generator, \$25. Large stock of carburetors, gears, axles, radiators and all parts. Large stock of used tires.

IOWA AUTO PARTS & WRECK CO.
827 West 2d Street Davenport, Iowa

When Writing to Advertisers, Please Mention Motor Age

P-A-R-T-S

FOR 100 MAKES CARS

From 1909 to 1917 inclusive

Money Refunded if not Satisfactory

IN FULL ASSEMBLY

We have Motors, Carburetors, Full Floating Rear Axles, Magnetos, of all standard cars
SHIPMENTS MADE PROMPTLY

50 to 90% Off Manufacturer's
Price List

WE WANT YOUR BUSINESS
Write today for prices.

GERTNER AUTO PARTS CO.
1631 O Street LINCOLN, NEB.

New Parts for

ORPHAN CARS

We make a specialty of furnishing new gears and axle shafts, axles, repair parts for motors and transmissions for cars that have been discontinued.

CUTTING MOTOR CARS

CLARK CARTER CARS

MILWAUKEE MOTOR

(All cars using same)

CONTENTAL ENGINE CO.

(Repair parts)

MASON MOTOR CARS

IMPERIAL MOTOR CARS

L. C. ERBES & CO.

2652 W. University Ave. St. Paul, Minn.

Save 50-90 Per Cent

AUTO FOR PARTS

Pope, Packards, Pierce, Knox, etc.

Motors, up.....	\$25.00	Presto Tanks, up...\$	4.50
Magnetos	4.00	New Spotlights	2.00
Carburetors	3.00	Generators	10.00
Rear Axles	15.00	Gears	1.00
Front Axles	5.00	Bearings	1.00
Cylinders	5.00	Radiators	10.00

Jobbers in Bankrupt Auto Supplies

Brightman Auto Exchange

84 Wooster Street Hartford, Conn.

WIRE WHEELS

NEW, REBUILT, REPAIRED

We have a full stock of Wire Wheels, Parts and Tools of all makes. Our plant is specially equipped for rebuilding and repairing on a large scale—which means quickest and best service at lowest prices.

Rebuilt Wheels, 50 to 75 per cent saving.

New Wheels—Rudge-Whitworth, Hayes, Houk, Dunlop, Pasco, etc.

Write your requirements. Ship your repairs.

WIRE WHEEL REPAIR CO., Inc.

146 W. 55th St. New York City

USED PARTS FOR SALE

Brush, Buick 2 cyl. 10-16-17-19-25-25C-30-31-35-37C. Chalmers 36, Cutting 12, E M F, All Models; Empire 31, Hudson 20-33, Krit 12; Kissel Kar 10, Maxwell 2 cyl., Masco and Special, Metz 22, Mitchell 11-12-14 4 cyl. and 14 Big Six, Wolffe 9, Oakland 35-40-42, Overland 38-39-59-69-79, Reo 10S-11-12, Regals to 13, Stoddard-Dayton H-10.

THE BONE YARD

Washington Iowa

USED For Any Make or Model Car
50 to 80% Off Mfrs. List.
PARTS Motors, Magnetos, Radiators
Carburetors

Get Our Prices First
Write Today—Don't Delay
LINCOLN AUTO PARTS COMPANY
2046 O. Street Lincoln, Nebr.

Parts and Repairs.

USED FOR ALL MAKES OF CARS!
 1/4 to 3/4 Off Mfrs. Price List.
PARTS Complete Motor or Parts for Same
 GEARS MAGNETOS AXLES
 Radiators, Carburetors, Transmissions
 ANY PART! LOWEST PRICES! WRITE TODAY!
SEIGEL AUTO WRECKING CO.
 129 Commercial Waterloo, Iowa
 "We Sell the Best—Junk the Rest"

USED MOTORS—\$35 to \$60

Four cylinder motors in lots of 50 at \$30.00 each.
USED PARTS—In stock for over 200 cars; write to-day, stating make of car, model and parts needed. Complete line of tires, used and unguaranteed factory seconds.

BADGER AUTO PARTS COMPANY

956-8 Teutonia Avenue Milwaukee Wisconsin

GUARANTEED PARTS

Half List Price—Genuine Packard, Cadillac, Buick, and other parts, all good as new. Goods shipped inside of 24 hours.
 Your money's worth or your money back.

E. W. SAUNDERS CO.

25 Stanhope Street BOSTON, MASS.

Krit Owners We furnish quick service on all engines, clutch, transmission, differential, front and rear axle, steering gear, wheels, steering knuckles and cones, fenders, frames and body parts—from original Krit stock. For all models from 1900-15, inc.

MOTOR CORPORATION

1309 Race Street Philadelphia, Pa.

PARTS

For Practically All Makes of Cars
 60 per cent to 85 per cent off list price.
 Send in your old parts for duplication. Write us your needs and get our price before buying elsewhere. Prompt Service.
INDIANA AUTO PARTS CO.
 446 South Meridian Street Indianapolis, Ind.

RACING SEATS AND BODIES

Free Illustrated Catalog on Request

JOS. P. LAROCHE & CO.

5918-20 S. ASHLAND AVE., CHICAGO, ILL.

AUTO PARTS CO.

2039 Farnam St., OMAHA, NEB.

BRANCHES: Sioux City Auto Parts Co., 612 Pearl St., Sioux City, Iowa; Twin City Auto Parts Co., 1215 Hennepin Ave., Minneapolis, Minn.

AUTO PARTS CO.

243 So. 11th St., LINCOLN, NEB.

ALL PARTS for all makes of cars, 50% OFF.

STODDARD DAYTON PARTS**PAIGE-DETROIT**

Rear Axle Bevel Gears and Pinions
 These Are All New parts

THE DAYTON AUTO PARTS CO.

357 West 52nd Street 1623A McGee Street
 New York City Kansas City, Mo.

SPEED SPECIALTIES—FORD

Underslung parts for Fords, complete with instructions, per set.....\$20.00
 Counterbalances for the Ford crankshaft, per set 12.00
 Speedway racing bodies.....129.50
 3 to 1 gears, 2 1/2 to 1, set..... 15.00

CRAIG-HUNT, Inc.

835 Lemcke Bldg. Indianapolis

AUTO PARTS

Before purchasing parts, write for our prices
 We have parts for any car

SULFAN AUTO PARTS AND RADIATOR CO.
 220 Grand River Ave. Detroit, Mich.

Parts and Repairs. Rebuilding and Repairing.

ATTENTION! MARION OWNERS**Parts for All Models**

SAVE YOUR MONEY—Buy your Transmission and Differential Parts from us, 30% discount allowed from list on all rear axle parts.

MARION MOTOR CAR CO. OF CHICAGO
 2450 Michigan Avenue Chicago, Ill.

GEARS

For Transmissions and Differentials.
 Shafts and Pins.

SERVICE GEAR & MACHINE CO.

"Manufacturers for the Trade"
 East Reading Pennsylvania

RIMS**RIMS****All Makes and Kinds**

Parts, Side and Lock Rings, Bolts and Wedges.
 Dealers, write for prices

CITY AUTO TIRE AND SUPPLY CO.

1847 E. 24th Street Cleveland, Ohio

USED PARTS

LARGE STOCK OF USED PARTS FOR ALL CARS

Write us today. Give name of car and model.

LOUISVILLE AUTO PARTS CO.

518 E. MARKET ST. LOUISVILLE, KY.
 "Satisfaction guaranteed or money refunded"

Rims—All New and Old Types

and parts for all makes of rims. Get my prices on spare rims, locking rims, side rings, for any make of car. Quick service. Free rim information.

KASTNER RIM CO.

2125 Michigan Avenue Chicago, Illinois

AUTO SPECIALS

Ward-Leonard Generators, \$8.00 each. Ford Engine Air Pump, \$3.00 each. Bosch Magnetos, 4 & 6 cylinder, \$10.00. Ford Master Vibrators, \$2.65. Presto Tanks, \$5.00. Charging Sets, \$30.00 each & up. Motor-Driven Air Compressors, \$35.00. Auto Motors, 4-cylinder Water Cooled, \$30.00. Buick, Hupp, Franklin, Continental and Buick Motors, all sizes, types and prices. Guaranteed. Write for new bargain bulletin.

JOHNSTON, West End, Pittsburgh, Pa.**AUTO PARTS**

Why pay full price when we can save you, on slightly used parts

50 Per Cent to 75 Per Cent

Solid Tires and Wheels, usable for Trucks and Trailers. Prices reasonable. **MOTORS**—\$40 to \$100. Write for specifications.

PRISCOL AUTO PARTS CO.

266 Grand River Avenue Detroit, Michigan

SPEEDSTER BODIES

For FORDS—Something New and Different
 The new ROYAL RADIATOR SHELLS and HOODS change your old Ford into a 1918-looking model. Special SPEEDSTER BODIES, HOODS, FENDERS, RADIATORS, made to order.

ROYAL AUTO SHEET METAL WORKS

1464 S. Wabash Ave. Dept. A. Chicago, Ill.

BOSCH MAGNETOS

Our Quantity Prices Will Interest You
 Gears, Axles, Bearings, Carburetors, Generators, Parts. Cleveland's leading parts dealer and Auto wrecker.

PROGRESS AUTO PARTS CO.

5121 Euclid Avenue Cleveland, Ohio

CRANK SHAFTS REGROUND
 NOT FILED AND REGROUND—BUT
 REGROUND ON SPECIAL GRINDERS!

CYLINDERS REGROUND

STAFFORD SUPREME SERVICE

STAFFORD MOTOR COMPANY

2201-09 Campbell Avenue. Kansas City, Mo.

Rebuilding and Repairing.

Cylinder Grinding

on special highest grade cylinder grinding machinery. No make-shift tools. Work handled by men with automobile factory experience. Large assortment of patterns for iron pistons. Complete stock of piston rings. Prompt service. Highest grade work only, fully guaranteed.

Aluminite Pistons and Aluminite Connecting Rods

Aluminite piston will put six cylinder smoothness into a four cylinder motor; improve a six or eight, give more power and quicker get-away. For prices, state make, model and year. Piston pins, aluminite connecting rods and racing motors.

For Tractors, these pistons will greatly increase the efficiency of the motor and save the bearings.

Power-Plus Cylinder Heads

For Ford Cars

Keep the Motor Cool

Give More Power and Speed

Motors

Complete stock—new and used—for all makes of cars. Every motor in perfect condition—no junk. We also build and overhaul motors, both automobile and aeronautical. Many a good car proves inefficient, due to motor trouble. We specialize in motor work, often changing a four-cylinder to a six, eight or twelve. Don't discard a car otherwise satisfactory because of motor trouble. Tell us your difficulty and let us solve the problem quickly, efficiently and at a reasonable expense.

Green Engineering Co.
 Dayton, Ohio

Rebuilding and Repairing.

Cylinders Reground

Over 800 Piston Patterns Always in Stock.

Our Expert Mechanics and our Highest Grade Equipment are your guarantee for highest class workmanship. Our Special Light Alloy Pistons will give you More Power—More Speed; we also do Gear Cutting of Spur and Bevel Gears.

Write to Us Today

Auto Engine Works
St. Paul, Minn.

Rebuilding and Repairing. Tires.

CYLINDERS REBORED

by our Expert Mechanics are PERFECT New Pistons and Rings fitted. Complete job from \$4.50 to \$9.50.

SEND YOUR WORK TO OTTUMWA

STAR AUTO & SUPPLY CO.
411 Church St. Ottumwa, Ia.

CYLINDERS REGROUND

\$5 to \$11 per cylinder, including pistons and rings. Alloy pistons, from \$1.50 to \$3.50 per cylinder, extra. Ford cylinders reground and fitted with pistons, rings, wrist-pins and bushings for \$11 per set of four.

Racing Motors a Specialty
D. R. NOONAN Paris, Illinois

Scored Cylinders Repaired

We use the same pistons. General machine work for foreign and American cars. All parts duplicated. Welding of all metals. Manufacturers of Catelein Hose Coupling. Ever-Ready Starters. U. S. Shock Eliminators. Quick service, satisfaction guaranteed.

ANDRE CATELAIN
1446-8 Indiana Avenue Chicago, Ill.

Rebuilding and Repairing. Tires.

CYLINDERS REGROUND

including new pistons and rings. Any size—\$7 to \$8 per cylinder. All our work guaranteed. Quick shipments. Let us prove our ability on your next job.

NEUPERT MFG. COMPANY
82 Lark Street Buffalo, N. Y.

WE GRIND

Cylinders and fit special heat-treated Pistons. Welding of all kinds of Metals. Gear Cutting of all kinds.

PONDELICK BROS.
Largest Mfrs. of Duplicate Auto Parts in U. S.
Leavitt St. & Jackson Blvd. Chicago, Ill.

CYLINDERS REBORED

By expert machinists on specially designed machines, insuring absolute accuracy and the highest attainable quality of finish. Special heat-treated extra light new pistons, and re-turned rings fitted without extra charge. Wrist pins to order. Reboring, autos, \$4.50 to \$9.50 per cylinder; special price on Fords.

PARK MACHINE CO.
22 W. 3rd Street St. Paul, Minn.

CYLINDERS REGROUND

Sixteen years' experience in cylinder regrounding enables us to offer you the highest grade of workmanship at reasonable prices.

\$5.00 to \$10.00

Per cylinder, including pistons and rings

\$12 Special Ford Job

MANUFACTURERS OF PISTONS AND RINGS

Crown Machine Shop
CROWN POINT INDIANA

CYLINDER REGRINDING PISTONS RINGS PINS

Largest in Middle West

Our complete records give Permanence and Continued Service

BUTLER MFG. CO.

Established 1897
1115 E. Georgia Indianapolis

CYLINDER
Reground—We Weld Anything
Fitted with cast iron or light pistons; leak-proof or plain piston rings. Best equipped shop in the country. Quick Service—Reasonable Prices—Gear Cutting
SIoux CITY WELDING & MACHINERY CO.
Dept. MA Sioux City, Iowa

CYLINDER GRINDING
Piston Rings and Wrist Pins made to fit. All work guaranteed. Prices Right. Prompt Service.
Finest, Most Accurate Machinery
BEST SKILLED MECHANICS
Modern Auto Repair & Reconstruction Co.
4605-4613 Olive Street, St. Louis, Mo.

CYLINDER GRINDING

High grade equipment assures best workmanship. Prices reasonable.

**MANUFACTURERS OF TRUMP
MULTIPLE PISTON RINGS**

TRUMP MFG. CO.
112 Union St. Crown Point, Ind.

SECONDS AT 50% OFF

—Non-Skid Only—No Mileage Guarantee—
20x3.....\$ 9.25 31x4.....\$18.30 34x4 1/2.....\$26.60
30x3 1/2.....11.75 32x4.....18.70 35x4 1/2.....27.80
31x3 1/2.....12.65 33x4.....19.60 36x4 1/2.....28.25
32x3 1/2.....13.75 34x4.....20.05 35x5.....32.65

10% Deposit Required, Balance C. O. D.
LAKE SIDE TIRE COMPANY
1339 Michigan Avenue Chicago, Illinois

USED TIRES

Best Values Ever Offered for the Money

Size		Size	
30x3.....	\$4.00	36x4.....	\$ 8.00
30x3 1/2.....	5.00	34x4 1/2.....	8.25
32x3 1/2.....	5.75	35x4 1/2.....	8.50
31x4.....	6.25	36x4 1/2.....	8.65
32x4.....	6.50	37x4 1/2.....	9.00
33x4.....	7.50	35x5.....	9.00
34x4.....	7.50	37x5.....	10.00

All goods shipped promptly. \$1 deposit required with each tire ordered. Balance C. O. D., subject to examination, at the above prices, without a guarantee. Specify whether new or used, Clincher or straight side.

ROYAL TIRE & SUPPLY CO.
1461 Michigan Ave. Chicago, Ill.

TIRES & TUBES

SLIGHTLY USED AND FACTORY REPAIRED
TIRES AND TUBES—QUALITY ABOVE ALL

The QUALITY of our tires and tubes is superlative, the PRICE cannot be equaled and our SERVICE cannot be excelled.

A satisfied customer is our biggest asset, therefore we must satisfy you.

Size	Tires	Tubes	Size	Tires	Tubes	Size	Tires	Tubes
30x3.....	\$ 4.00	\$1.35	32x4.....	\$ 7.00	\$1.60	35x4 1/2.....	\$ 8.50	\$1.80
30x3 1/2.....	5.00	1.45	33x4.....	7.75	1.70	36x4 1/2.....	8.75	1.85
31x3 1/2.....	5.25	1.50	34x4.....	7.75	1.70	37x4 1/2.....	9.25	1.90
32x3 1/2.....	5.50	1.50	35x4.....	8.00	1.75	35x5.....	9.50	2.00
34x3 1/2.....	6.00	1.60	36x4.....	8.00	1.75	36x5.....	9.50	2.00
31x4.....	6.25	1.65	34x4 1/2.....	8.25	1.75	37x5.....	10.00	2.20

Send \$1.00 deposit with each tire ordered. Tires will be sent promptly C. O. D., with privilege of examination. Specify style of rim to avoid delay.

Our slightly used tires bear no mileage guarantee; but in the event that they do not give service in proportion to the price, you may return them to us by prepaid express and we will cheerfully make a fair adjustment.

LINCOLN TIRE & SUPPLY CO.
1463 S. Michigan Ave. Dept. M. Chicago, Illinois

Tires.

Tires.

Tires.

SLIGHTLY USED TIRES TIRES THAT HAVE BEEN

Bought from the large tire factories and are in excellent condition. All sizes ready for immediate shipment.

No mileage guarantee, but we warrant satisfactory service and will make any reasonable adjustment

30 x 3.....\$4.50 31 x 3½.....\$6.00 31 x 4.....\$7.00 33 x 4.....\$8.00 34 x 4½.....\$9.00 36 x 4½.....\$10.00 35 x 5.....\$11.00
30 x 3½.....5.50 32 x 3½.....6.75 32 x 4.....7.50 34 x 4.....8.00 35 x 4½.....9.50 37 x 4½.....10.50 37 x 5.....12.00

Specify whether clincher or straight side. Send \$1.00 deposit with each tire ordered. Balance C. O. D., with privilege of examination. Dealers given immediate attention.

TIRES THAT WILL

("Go the Guarantee Way and You Can't Go Wrong")

GIVE GOOD SERVICE

GUARANTEE TIRE & EQUIPMENT CO. 36th St. and Michigan Ave.
CHICAGO, ILLINOIS

TIRES

**SPECIAL SPECIAL SPECIAL
ECONOMY TO MOTORISTS**

Select Your Supply Now for The Season—Slightly Used and Factory Repaired

TIRES and TUBES

A TRIAL WILL CONVINCE YOU

Largest and most complete stock of slightly used tires in all makes for immediate shipment.—NO JUNK.

Size	Tires	Tubes	Size	Tires	Tubes
30x3.....	\$4.00	\$1.35	35x4.....	8.00	1.75
30x3½.....	5.00	1.45	36x4.....	8.00	1.75
31x3½.....	5.25	1.50	34x4½.....	8.25	1.75
32x3½.....	5.50	1.50	35x4½.....	8.50	1.80
34x3½.....	6.00	1.60	36x4½.....	8.75	1.85
31x4.....	6.25	1.65	37x4½.....	9.25	1.90
32x4.....	7.00	1.60	35x5.....	9.50	2.00
33x4.....	7.75	1.70	36x5.....	9.50	2.00
34x4.....	7.75	1.70	37x5.....	10.00	2.20

Freight Prepaid on all orders exceeding \$50.00 when check in full accompanies order, otherwise \$1.00 deposit with each tire ordered. Specify style of rim to avoid delay.

Although at the above prices these tires bear no mileage guarantee we will make reasonable adjustments should they prove unsatisfactory. All tires sent in for adjustment must be prepaid.

We also carry a complete stock of new tires

AETNA TIRE & SUPPLY COMPANY

1429 Michigan Avenue

Chicago, Illinois

Odd Size

Pneumatic Tires

We can ship immediately from stock at attractive prices, odd size pneumatic casings or tubes, such as 31x4 straight side, 32x3 clincher, 34x3½, 35x4, 36x4, 36x3½, 37x4, 37x4½, 37x5½ in quick detachable or straight side. The above will be sold without a mileage guarantee.

These are all brand new casings!

Standard makes. No seconds!

Send your orders or inquiries to

Powell Supply Co.

The Pioneer Auto Supply House of the
Central West

2051 Farnam St. Omaha, Neb.

HIGH GRADE QUALITY TIRES & TUBES

Manufacturer's Surplus Stock of Factory Seconds

Size	Plain	Non-Skid	Tubes	Size	Plain	Non-Skid	Tubes
28x3.....	\$8.35	\$8.75	\$1.80	34x4.....	\$17.55	\$18.45	\$3.40
30x3.....	7.95	8.55	1.95	36x4.....	18.95	19.60	3.65
30x3½.....	10.35	10.95	2.30	34x4½.....	22.60	24.90	4.15
32x3½.....	11.65	12.90	2.40	35x4½.....	23.60	25.10	4.30
31x4.....	16.15	16.90	3.00	36x4½.....	23.90	26.60	4.40
32x4.....	16.55	17.30	3.05	37x4½.....	30.75	31.45	5.30
33x4.....	17.10	17.85	3.25	35x5.....	29.85	31.30	.....

We warrant each and every casing to give satisfactory service, but do not give any definite mileage guarantee

5% FOR CASH IN FULL WITH ORDER.

Save this discount, as upon arrival of shipment you still have the privilege of returning any items which do not come up to expectations for full cash refund.

STERLING TIRE & SUPPLY HOUSE

1355 Michigan Avenue

CHICAGO, ILL.

\$100,000 Stock

STANDARD MAKE NEW TIRES
AT GREATLY REDUCED
PRICES

TIRES AND TUBES

No definite mileage guarantee, but reasonable adjustments cheerfully made.

SPECIAL PRICES TO DEALERS ON QUANTITY ORDERS

SERLIN TIRE CO.

1300-1302 Michigan Ave. Chicago

Slightly Used Tires

STANDARD MAKES—NO JUNK

Size	Tire	Size	Tire
30x3.....	\$4.00	36x4.....	\$8.25
30x3½.....	4.70	34x4½.....	8.25
32x3½.....	5.70	35x4½.....	8.25
31x4.....	6.20	36x4½.....	8.50
32x4.....	6.75	37x4½.....	9.25
33x4.....	7.00	35x5.....	9.00
34x4.....	7.50	36x5.....	9.00
35x4.....	8.00	37x5.....	10.00

—No mileage guarantee at above prices—
Specify whether O. D., Clincher or Straight Side
\$1.00 Deposit Required on Each Order, Balance
C. O. D., Subject to Examination

**Delco Tire and Vulcanizing
Company**

1545 S. Mich. Ave. Ph. Calumet 4858 Chicago

TIRES

Factory Blemished ALL STANDARD MAKES

No mileage guarantee.

Order from Us and Save Money

Money Back if Not Satisfied

Size	Plain	Skid	Size	Plain	Skid
30x3.....	\$8.25	\$9.25	34x4.....	\$18.50	\$20.50
30x3½.....	12.25	13.50	34x4½.....	23.50	26.00
32x3½.....	12.25	13.50	35x4½.....	25.00	27.50
31x4.....	15.80	18.50	36x4½.....	26.00	28.50
32x4.....	16.75	19.25	35x5.....	29.00	31.00
33x4.....	17.75	19.75	37x5.....	30.00	32.50

Other sizes in proportion.

Special Prices on Tubes Tires Sent Anywhere

10% with order, balance C. O. D., subject to inspection

THE OHIO GUARANTEE TIRE

& RUBBER CO.

5510 Euclid Ave. CLEVELAND, OHIO

(Dealers wanted)

Special Bargains in

SLIGHTLY USED TIRES

The kind that will satisfy all customers.

30x3.....	\$4.00	34x4.....	\$8.00
30x3½.....	5.00	34x4½.....	8.25
32x3½.....	6.00	35x4½.....	8.50
31x4.....	6.50	36x4½.....	8.75
32x4.....	7.00	37x4½.....	9.50
33x4.....	7.75	37x5.....	10.00

Send \$1.00 deposit with each tire ordered. Balance C. O. D., subject to examination. Specify if Clincher, Q. D., or Straight Side.

No Mileage Guarantee at the Above Prices

American Tire & Vulcanizing Co.

Phone: Calumet 5170

2136 S. MICHIGAN AVE. CHICAGO, ILL.

When Writing to Advertisers, Please Mention Motor Age

Tires. Magnets and Service Stations.

Tires. Magnets and Service Stations.
Radiator and Lamp Repairing.Tires. Miscellaneous.
Mailing Lists.**STANDARD MAKE
USED TIRES**

Size	Tires Tubes	Size	Tires Tubes
30x3.....	\$4.50 \$1.35	36x5.....	\$9.00 \$2.00
30x3½.....	5.50 1.50	34x4½.....	9.00 2.25
31x3½.....	6.00 1.60	35x4½.....	9.50 2.25
32x3½.....	6.50 1.75	36x4½.....	9.50 2.25
31x4.....	7.25 1.80	37x4½.....	10.50 2.40
32x4.....	7.50 1.85	35x5.....	11.00 2.50
33x4.....	7.75 1.90	36x5.....	11.50 2.50
34x4.....	8.00 1.95	37x5.....	12.00 2.75

No mileage guarantee at these prices

\$1.00 deposit required on each tire ordered.

Balance C. O. D., subject to examination. Also full line of high grade seconds.

SEND FOR PRICES

ARMSTRONG TIRE & VULCANIZING CO.

1336 Michigan Ave. Chicago, Ill.

Branch: 1612 Michigan Ave.

Phones: Calumet 5212, Calumet 2199

**BILTRITE Rebuilt Tires
That ARE REBUILT**

After the tread is worn out 60 per cent of the tire's material value is still in the tire. It should be utilized. It should be rebuilt by the BILTRITE process. This consists of testing the tire, buffing the tread from the carcass, supplying a reinforcing fabric, then building up as is done in the standard tire factories. Such corporations as the New York Telephone Company, the Shredded Wheat Company, and the Green Fuel Economizer Company are practicing BILTRITE economy. Why don't you?

Size	You Supply Casing	We Supply Casing	Size	You Supply Casing	We Supply Casing
30x3.....	\$ 9.10	\$10.60	33x4.....	\$17.25	\$19.00
30x3½.....	11.25	12.75	34x4.....	17.75	19.50
32x3½.....	13.50	15.00	35x4.....	18.75	20.50
34x3½.....	15.50	17.00	36x4.....	19.25	21.00
31x4.....	13.50	15.25	33x4½.....	22.50	25.00
32x4.....	16.75	18.50	34x4½.....	25.25	28.00

Specify style of rim. Send \$1.00 deposit (orders to office; casings to factory). Tires sent promptly C. O. D. BILTRITE tires carry no mileage guarantee—but they are warranted to give satisfaction and will be adjusted on a basis of mileage given.

THE CONDEX TIRE COMPANY, Inc.

Factory: 685-A Eleventh Avenue

NEW YORK CITY

Office: 1416 Broadway

**HIGH GRADE
TIRES AND TUBES**

Factory Seconds, Unguaranteed, at Interesting Prices. Also complete line of Firsts. Write Us Your Needs

ACORN TIRE & REPAIR CO.
1547 So. Michigan Ave. CHICAGO, ILL.

**ELECTRIC REPAIR
SERVICE**

We represent eight factories

ELECTRICAL TESTING CO.
PEORIA, ILL.

**WE PAY CASH FOR
PLATINUM SCRAP**

Mercury, contact points, old false teeth. Send us what you have for disposal, no matter how much or how little, and we will remit full market value by return mail.

THE MUTUAL SMELTING & REFINING CO.
54 South Front St. COLUMBUS, OHIO

**IF IT'S ELECTRICAL WE
CAN FIX IT**

ANY STARTING, LIGHTING,

IGNITION SYSTEM

WE OFFICIALLY REPRESENT

BERLING MAGNETO CONNECTICUT
PHILBRIN BENDIX DRIVES
WESTINGHOUSE JESCO (Jones Starter)
K. W. IGNITION DYNETO
HEINZE SPRINGFIELD FORD STARTERS
VAN SICKLEN SPEEDOMETERS
WALTHAM SPEEDOMETERS
BRANFORD CARBURETOR

LET THE MAN WHO KNOWS
HANDLE YOUR REPAIR WORK

Arthur Jones Electric Co.

Established 1903
2837 S. STATE ST. CHICAGO, ILL.

RADIATORS

Get a Square Tube Radiator, 25% greater water capacity. Made for any car. New, guaranteed cores placed in old radiators. We also manufacture hoods, fenders, tanks and pans, and do guaranteed repair work. Prompt and satisfactory service.

CHICAGO MANUFACTURING CO.
1458-60-62-64 Michigan Avenue Chicago, Ill.

**RADIATORS REPAIRED
PROPERLY**

Anybody may attempt to repair your radiator. To succeed is another matter.

SEND IT TO DENVER

W. H. NEVEU, "The Radiator Man"
Largest in the West. 1327-35 Broadway, Denver, Colo.

**Samuel L. Winternitz & Company
AUCTIONEERS**

Largest Liquidators of Motor Plants

FIRST NAT. BANK BLDG. CHICAGO, ILL.

WANTED

A Buick Model 21 Crank Case

JAS. McDONALD

New Market

Iowa

SEND IT TO DETROIT

FACTORY REPAIRS FOR YOUR ELECTRICAL STARTING, LIGHTING AND IGNITION EQUIPMENT

Our shop handles automobile factory work for the electrical manufacturers. Trained factory experts to repair and test your equipment. Complete parts stock insures prompt service.

Official Representatives & Service Station For

Bijur Berling Magnets
Auto-Lite Connecticut Ignition
Dyneto K-W Ignition
Westinghouse Philbrin Ignition
Eclipse Bendix Norma Bearings
Tillotson Carburetors Atwater-Kent Ignition
Heinze-Springfield Ford Starters

Auto Electric & Service Corporation
11-13-15-17-19 Selden Avenue

RADIATORS

We repair Radiators of all kinds—Any Make or Any Style

MITCHELL RADIATOR REPAIR COMPANY
933 Ft. Wayne Ave.

Indianapolis Indiana
Buy and Sell Used Radiators

RADIATORS

OUR HONEYCOMB RADIATOR embodies STRENGTH COOLING POWER NEATNESS
Repairing and recoring old radiators. Everything in the automobile sheet metal line
We solicit your inquiries

ILLINOIS AUTO SHEET METAL WORKS
Veteran Radiator Experts of the West
3200 S. Michigan Ave. Chicago, Ill.

AUTO MAILING LIST

44,755 Auto Dealers, U. S. \$3.00 per M.
7,949 Ford Dealers, U. S., \$20.00, or... 4.00 per M.
5,519 Truck Dealers, U. S., \$12.00, or... 4.00 per M.
(Showing make of truck handled.)
150,000 Truck Owners, U. S. 7.50 per M.
5,400 Truck Owners in Chicago,
\$15.00, or 3.50 per M.
46,943 Garages, U. S. 3.00 per M.
55,967 Auto Supplies, Retail, U. S. ... 3.00 per M.
45,054 Repair Shops 3.00 per M.
404 Auto Mfrs. 3.00 per M.
73,674 Auto Dealers, Garages, Supplies and Repairs in one list,
no duplicates 3.00 per M.
1,502 Auto Supply Jobbers.....\$5.00
Complete list auto owners and Ford owners, \$2.50 per M. Further particulars

TRADE CIRCULAR ADDRESSING CO.
166 W. Adams St. (Franklin 1182) Chicago

**Expert Repair
Service**

ON EVERY KNOWN
MAGNETO IGNITION SYSTEM
GENERATOR STARTING MOTOR
ARMATURE WINDING
All Repairs Promptly Executed
All orders for repair parts shipped the day orders are received

AMERICA'S MOST COMPLETE
IGNITION, LIGHTING AND STARTING
INSTITUTION

PELLET MAGNETO CO.

Twenty-fifth and Wabash Avenue.
CHICAGO

W(RIGHT) RADIATORS

Have stood the test for years—most durable and efficient. Get the best at less cost than others. Don't order until you send for our prices and illustrations of construction. Honeycomb and Bridge Fin Type (tubular). All standard makes in stock. Exceptionally low prices on Fords. Dealers' discount.

WRIGHT COOLER AND HOOD CO.

1253 Michigan Avenue Chicago, Ill.

INDIANA AUTO LISTS

200,000 names, compiled by counties in type-written form, showing name, address, make, model and 1918 registration number. Special lists of any make of car. Can furnish list dealers in any state.

CAMPBELL CIRCULAR ADVERTISING CO.
PRINTING MAILING ADDRESSING
240 South Meridian St. Indianapolis, Ind.

Pioneer

RADIATOR Manufacturers

Rebuilding, Repairing, and Manufacturing of Radiators for any make of car. Why send your Radiator down East when you can ship to us; save time, expense, freight, money, and be assured of expert workmanship? Our prices are right. We make new Radiators and allow for old ones.

TODD MANUFACTURING CO. Minneapolis, Minn.

Patents and Patent Attorneys.
Cars and Garages for Sale.

PATENTS

Write for How to Obtain a Patent, list of Patent Buyers and Inventions Wanted. \$1,000,000 in prizes offered for inventions. Send sketch for free opinion as to patentability. Our Four Books sent free. Patents advertised Free. We assist inventors to sell their inventions.

VICTOR J. EVANS & CO., 783 Ninth, Washington, D. C.

C. L. PARKER

Formerly Member Examining Corps, United States Patent Office

ATTORNEY-AT-LAW AND SOLICITOR OF PATENTS American and foreign Patents secured. Searches made to determine patentability and validity. Patent suits conducted. Pamphlet of instructions sent upon request. McGill Building, WASHINGTON, D. C.

FORD SPEEDSTER FOR SALE

Vern Abbott, having been called to the army for perhaps an indefinite period, offers his Ford Racer for sale. It took 2nd prize in Ill. Championship Race at Chicago Speedway, 1916. Rebuilt, new frame and body design. Straight line drive. Newly painted and equipped for speed. Address

C. T. ABBOTT
219 E. Judd Street Woodstock, Ill.
Phone 262 W.

FOR SALE

Good paying Garage in Eastern Indiana. Ford agency. Wonderful opportunity for man with small capital. Must sell. Address

Box E-860 care of MOTOR AGE

Supplies and Accessories.
Welding. Help Wanted.

Buy a MILLER STARTER, \$5.00

and four or five good dry batteries, equip your Ford with them, and you will have practically all an electric starter will give you, at a fraction of cost for installation or upkeep of an electric. Write H. A. MILLER, Memphis, Mo. Any one can install, as no holes to drill or machine work.

EXPERT WELDING SERVICE

Cylinders, Crank Cases, Housing and Gear Cases welded by our expert method—prices reasonable.

SUPERIOR WELDING CO.

331 Knoxville Ave. Peoria, Ill.

WANTED

Two salesmen to work on a commission basis selling OLDSMOBILE and CHEVROLET Cars. Must furnish good reference.

THE FARNER MACHINE COMPANY
Rutland Illinois

WANTED

Experienced stock room man, shop foreman and service man for Ford work only.

MORTENSEN & BURKHARD

Garage
Winner South Dakota

Schools.

FREE BOOKLET

"How to Succeed in the Automobile Business" on application. \$40,000 equipment—eight instructors—actual work repairing and driving—day and evening classes.

GREER COLLEGE OF AUTOMOBILE, TRACTOR & AEROPLANE ENGINEERING
1456 Wabash Avenue Chicago, Illinois

CONTRACT WORK

Advertisers in this section have facilities at their disposal to take on additional work on contract. Automobile specialties of all kinds manufactured on contract basis. Special machinery, press work, auto machine work, foundry work, automatic screw machine work.

METAL STAMPINGS, JIGS, DIES, GAGES, SPECIAL TOOLS, ETC.

KRASBERG MFG. CO.

536 LAKE SHORE DRIVE CHICAGO
Opp. Municipal Pier

MANY FIRMS ARE GETTING business by telling of their facilities in these sections.

Why not you?
Full information gladly given
CLASSIFIED DEPARTMENTS
Motor Age, Mallery Bldg., Chicago

The **BILLINGS & SPENCER CO.**
Hartford, Conn.
Hand Tools **B** Forge Shop
Forgings Machinery

DRIVER AGENTS WANTED
To Sell
The Roedding Signal Tail Light
A Pleasant Profitable Business. Easy to Sell. Business Grows Rapidly.
Write Today for our Special Proposition
K. G. BARKOOT, Sole Distributor
1010 Chamber of Commerce Building DETROIT

Inner armor for automobile tires prevents punctures and blow-outs. Double mileage of any tire, old or new. Easily applied without tools. Used over and over in several tires. Will not heat or pinch. Cheaper and better than double treads, etc. Details free. Distributors and agents wanted. Sales guaranteed.

INSYDE TYRES

AMERICAN ACCESSORIES CO., 250 Gulow St., Cincinnati, Ohio

NO CARBON—MORE POWER—LESS FUEL
Every Set Guaranteed
7 years' success. Popular sizes 50c. If your jobber can't supply you order direct, Parcel Post is quick. Gives results no other ring can. Write for free booklet R-6.

"NO-LEAK-O"
OIL SEALING PISTON RINGS
NO-LEAK-O
NORWOODS
PISTON RING

AUTOMOBILE ACCESSORIES CO., Baltimore, Md.

CONTRACT WORK DEPARTMENT

Page 117 This Issue

You will save time and money by consulting this Department

KNOX CARBURETOR

Saves 10% to 30% Fuel

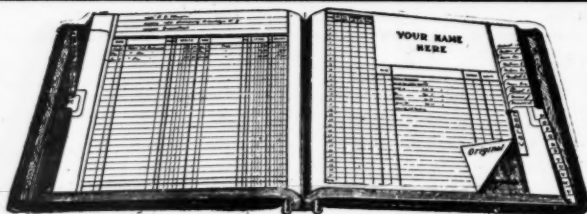
A True Automatic Multiple-Jet Carburetor, with Only One Moving Part. Self-adjusting to any weather, altitude, or motor conditions. Unconditionally guaranteed. Write for full particulars.

Manufacturers of KNOX Motors, Carburetors, Launches

CAMDEN ANCHOR-ROCKLAND MACHINE CO., Camden, Me.

America's Standard
Continental Motors
Detroit Michigan





GET A SAMPLE BOOK FREE

It will show you how simple,
sure and convenient is this

"Akkurate" Self-Indexing Ledger and Statement System

It cuts out all red tape—it does away with all clumsy, cumbersome bookkeeping methods, with their complications and heavy books.

Admirably and Exactly Adapted for Garages and Supply Dealers

One entry is made from sales slip—one final entry at end of month. When your last entry is made your job is complete, your monthly bills are ready for mailing and you have duplicate bills in your Akkurate system.

*This bookkeeper can't be drafted—
doesn't get sick, change his job or
strike for higher wages.*

Fill in the Coupon below—at once
Costs you nothing—will do a lot for you

**ACCURATE SYSTEM AND
MANIFOLDING CO.**
Makers of Modern Business
Systems for Garage and
Supply Dealers.

12 Elm St.
New York

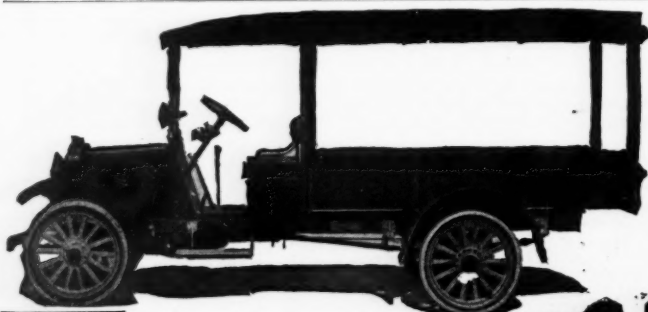
Special Offer

The coupon
herewith is
worth \$2.75 to
you. That means
that if you buy our
system through this
advertisement we shall
rebate you \$2.75 from our
printed list price. This offer
stands good for the month of
July, 1918.

Accurate
System and
Manifolding
Co., 12 Elm St.,
New York City.

Gentlemen: Please tell
me exactly how your
systems can help me in
my garage (or supply
store). Send this information
without obligation to me.

Name
Address
City and State.....
MA



Commerence

A Year Ahead of Other Trucks

The only truck having everything
necessary on it—when you buy it

Three types of bodies for all models—Bijur Starting and
Lighting System, with Dixie Magneto Ignition—Stewart
Vacuum System—Pierce Governor—Windshield—Bumper.
Continental Motor (3 1/4 x 5)—Torbenson Rear Axle—Detroit
Steel Products Company Springs.

One-ton Chassis.....\$1340
With Express Body.....1375
With Post Top and Stern Curtains.....1450
With Standard Stake Body.....1490

THE COMMERCE MOTOR CAR COMPANY
DETROIT, MICH.

W. H. Brinkerhoff, Eastern Dist. Mgr.
Belmont Ave., Elmhurst, Long Island, N. Y.

Index to the

Accurate System & Manifolding Company.....	118
Acme Motor Truck Company.....	90
Ahlberg Bearing Company.....	109
American Accessories Company.....	117
American Window Glass Company.....	101
Anchor Top & Body Company.....	52
Anderson Electric Specialty Company.....	108
Atwater-Kent Manufacturing Company.....	104
Automobile Accessories Company.....	117
Automobile Blue Book Publishing Company.....	88
Automobile Wood Wheel Manufacturers.....	75

Barkoot, K. G.....	117
Bearings Company of America.....	102
Benford Manufacturing Company.....	106
Bergie National Spark Plug Company.....	108
Bethlehem Motors Corporation.....	60
Billings and Spencer Company.....	117
Black and Decker Manufacturing Company.....	104
Blood Brothers Machine Company.....	107
Bosch Magneto Company.....	109
Bound Brook Oil-less Bearing Company.....	105
Bower Roller Bearing Company.....	80
Box E-861, c/o Motor Age.....	102
Briscoe Manufacturing Company.....	107
Briscoe Motor Corporation.....	71
Brown-Lipe-Chapin Company.....	103
Brunner Manufacturing Company.....	97
Bryne, Kingston and Company.....	102
Budrick Rubber Company.....	106
Buell Manufacturing Company.....	101
Burd High Compression Ring Company.....	103
Burlington Basket Company.....	97

Camden-Anchor Rockland Machine Company.....	117
Cassidy, Edward A., Company.....	63-93
Century Storage Battery Company.....	106
Chase, L. C., Company.....	103
Clearing House.....	110-117
Commerce Motor Car Company.....	118
Continental Motors Corporation.....	117
Cooper Manufacturing Company.....	79
Coreoran-Victor Company.....	61
Covert Gear Company.....	68
Curtis Pneumatic Machinery Company.....	94

Defender Auto Lock Company.....	108
Detroit Accessories Corporation.....	104
Disco Electric Manufacturing Company.....	107
Dunn Counterbalance Company.....	109
Duplex Cantilever Spring Company.....	98
Dyneto Electric Company.....	108

Eclipse Machine Company.....	106
Econ-O-Kleen Fuel Company.....	93
Eisemann Magneto Company.....	89
Electric Auto-Lite Corporation.....	102
Elgin Motor Car Corporation.....	104
Elkhart Carriage and Motor Car Company.....	4
Ever-Tight Piston Ring Company.....	54

Fafnir Bearing Company.....	100
Firestone Tire and Rubber Company.....	72
Four Wheel Drive Auto Company.....	81

Gabriel Manufacturing Company.....	57
Gasket Supply Company.....	106
General Gas Electric Company.....	85
Globe Manufacturing Company.....	100
Goodrich-Lenhart Manufacturing Company.....	82
Gordon, J. P., Company.....	109
Gray & Davis.....	2
Guarantee Liquid Measure Company.....	106
Gurney Ball Bearing Company.....	119

Halladay, L. P., Company.....	94
Haney, J. H., and Company.....	96
Hartford, Edward V., Incorporated.....	109
Haywood Tire and Equipment Company.....	96
Hession Tiller and Tractor Company.....	53
Higgins Spring and Axle Company.....	103
Hill Pump Valve Company.....	2nd cover
Hollenden Hotel.....	101
Hoover Steel Ball Company.....	100
Howe Manufacturing Company.....	back cover

Advertisements

J and D Tire Company..... 70
 Jenkins Vulcan Spring Company..... 103
 Jewell Electrical Instrument Company..... 92
 Johnson Company..... 59
 Johnson, S. C., and Son..... 1
 Joliet Oil Tractor Company..... 120

K. B. C. Company..... 103
 Kellogg Manufacturing Company..... 73
 Kimball Tire Case Manufacturing Company..... 108
 Kissel Motor Car Company..... 107

Lalley Electro-Lighting Corporation..... 56

Master Trucks..... 109
 McDaniel, Leo, Rubber Company..... 107
 McQuay-Morris Manufacturing Company..... 3rd cover
 Mercer Automobile Company..... 104
 Merchant, M. H..... 103
 Metal Specialties Manufacturing Company..... 107
 Miles Manufacturing Company..... 109
 Moltrup Steel Products Company..... 103
 Motor World..... 99
 Mutty, L. J., Company..... 95

National Wire Wheel Works..... 105
 New Departure Manufacturing Co..... 77
 New York and New Jersey Lubricant Company..... 107
 Norma Company of America..... 3
 Norwalk Tire and Rubber Company..... 67

Ohio Grease Company..... 98
 Oneida Motor Truck Company..... 98

Paco Manufacturing Company..... 102
 Petry, N. A., Company..... 105
 Phillips-Brinton Company..... 87
 Phillips Engineering Company..... 109
 Pierce Governor Company..... 99
 Pla-Safe Company..... 105

Remington Manufacturing Company..... 100
 Redden Truck Company..... 56a to 56d
 Ross Gear and Tool Company..... 49
 Russell Manufacturing Company..... 105

St. Louis Electrical Works..... 104
 Schrader's Son, A..... 99
 Selden Truck Sales Company..... 102
 Shaler, C. A., Company..... 84
 Sheldon Axle and Spring Company..... 58
 Smith, L. E., Glass Company..... 101
 Sparks-Withington Company..... 108
 Splittorf Electrical Company..... 74
 Standard Motor Truck Company..... 105
 Standard Parts Company..... 64 and 65
 Stephens Motor Branch of Moline Plow Co..... 51
 Stevens and Company..... 105
 Storm Manufacturing Company..... 107
 Stromberg Motor Devices Company..... 105
 Stutz Motor Car Company..... 55
 Sunderman Corporation..... 91

Thermoid Rubber Company..... 76
 Traffic Motor Truck Company..... 62
 Traverse City Refrigerator Company..... 106
 Triangle Motor Truck Company..... 83

U. P. C Book Company..... 90-95
 U. S. Ball Bearing Manufacturing Co..... front cover
 U. S. Light and Heat Corporation..... 66
 Universal Tool Company..... 108

Vanderpool Company..... 104

Waukesha Motor Company..... 69
 Weston Electric Instrument Company..... 104
 Wheeler-Schebler Carburetor Company..... 102
 Wheelless-Wilson Auto Supply Company..... 92
 Winther Motor Truck Company..... 108
 Winton Company..... 102
 Wire Wheel Corporation of America..... 98
 Wolf, Fred W..... 86
 Wonder Sales Company..... 59
 Woodworth Manufacturing Corporation..... 78

Zenith Carburetor Company..... 106

THE ADVERTISERS' INDEX is published as a convenience and not as a part of the advertising contract. Every care will be taken to index correctly. No allowance will be made for errors or failure to insert.



Greater Load Capacity

Gurney Ball Bearings have greater load capacity than other ball bearings because their peculiar method of assembling permits filling the races full of balls without cutting a filling slot, which would reduce the capacity of the raceway.

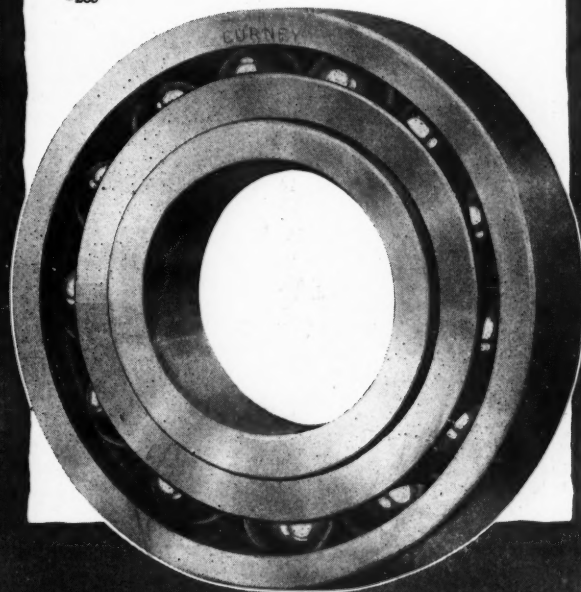
F. W. Gurney was the man to invent this method of assembling Ball Bearings.

We have an interesting series of bulletins which show different Ball Bearing applications. Write for it today.

Gurney Ball Bearing Co.

Conrad Patent Licensee
 Jamestown, N. Y.

-283



GURNEY

BALL BEARINGS

Enclosed Working Parts

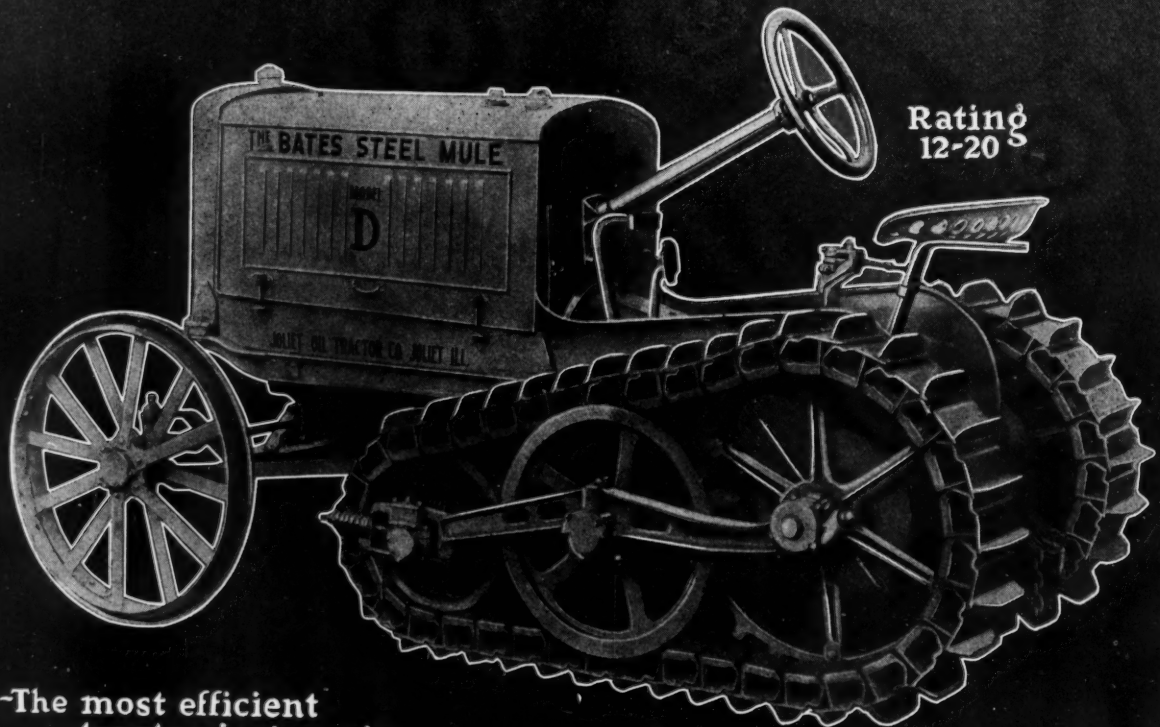
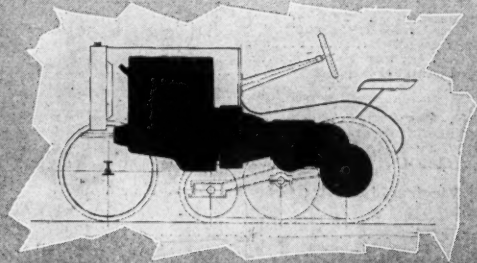
The unit construction of the Bates Steel Mule is such that not only is protection from dust afforded, but a permanent rigid alignment of transmission parts with the motor is assured, regardless of any severe twisting strains to which the tractor may be subjected.

All working parts of course operate in an oil bath.

This feature, with the powerful twin crawlers driven by the valve-in-head, heavy duty kerosene motor, the hardened cut steel transmission gears and Timken roller bearings, makes the Steel Mule a long-service tractor.

Write for complete description and information.

JOLIET OIL TRACTOR CO.
307 Jackson Street
Joliet, Illinois



-The most efficient tractor in America -

Seven Years of Use Has Proved Them

McQUAY-NORRIS

LEAK-PROOF

PISTON RINGS

Increase power—save fuel and oil. Decrease carbon trouble—cut down running expense

Many owners install these rings as a matter of course in each succeeding car or engine they buy. They have found it real economy to put in the best piston rings obtainable.

For over seven years McQuay-Norris **LEAK-PROOF** Piston Rings have been giving car and engine users increased power at decreased cost. They improve compression by preventing escape of gas. Keep down excess oil—reduce carbon—keep spark plugs cleaner.

The McQuay-Norris **LEAK-PROOF** design is exclusive. Not an experiment but tried and found efficient by the test of seven years of performance.

This design is the secret of piston ring efficiency. It has solved once and for all the piston ring question. Standard everywhere because they have made good so consistently.

Obtainable anywhere—in all standard sizes and over-sizes—for every make and model of motor, automobile, engine, etc. Over 300 jobbing and supply houses carry complete service stocks. Any unusual size or over-size quickly supplied from factory stock.

Build up your piston ring replacement business on this assurance of service. It guarantees a prompt, satisfactory job in every instance, and that means pleased customers. Your shop will get the benefit in increased business and larger profits.

SEND FOR FREE BOOKLET

"To Have and To Hold Power,"—all about power and piston rings. Every dealer, garage and repair man should read it. Write Dept. M.

Manufactured by

McQuay-Norris Mfg. Co., St. Louis, U. S. A.

BRANCH OFFICES:

New York Chicago Pittsburgh San Francisco Los Angeles
Seattle Kansas City St. Paul Atlanta Dallas
Canadian Factory: W. H. Banfield & Sons, Ltd., 372 Pape Ave., Toronto



McQUAY-NORRIS
Superoyl
RINGS

If a motor is giving trouble with excess oil it needs McQuay-Norris **Superoyl** Rings. A specially constructed ring with an oil reservoir that collects all excess oil from the cylinder, leaving just the film necessary for proper lubrication. Used in the top groove only of each piston, with McQuay-Norris **LEAK-PROOF** Piston Rings in all lower grooves, to insure maximum compression, power and fuel economy.



For Engines
that are
Oil Gushers

STAMP OUT THE WAR WITH THRIFT STAMPS



HOWE

Kork Tred

PAT. PENDING
CLAIMS ALLOWED

The perfected cork-inlaid transmission lining for FORD cars

Holds Like a Bulldog

There is no other Ford transmission lining made that is "just as good" as Kork Tred, no other that has the exclusive Kork Tred improvements, no other that will serve as efficiently or wear as long.

The Kork Tred grip combines the smoothness of velvet with the sure, satisfying hold of the bulldog. It eliminates the grabbing, the jerking, the slipping common to cars equipped with ordinary transmission linings, which become glassy smooth in a few months of use.

Why the Cork Disks Cannot Come Out

The disks of cork cannot come out. They are securely held in clincher cups, firmly riveted in high-grade fabric. This is an exclusive feature of Kork Tred.

These clincher cups also serve as tiny oil reservoirs, holding the lubricant that the cork disks absorb and releasing the oil when pressure is applied, thus making brake and transmission action smoother and more quiet.

Kork Tred Saves Motor Energy

All the engine power is applied to the rear wheels. Kork Tred is made to serve and to last, not to be replaced as faulty in a short time. The cost is exceptionally low—\$3 a set.

Hundreds of jobbers and dealers have found that Kork Tred is a sure and fast seller. Our proposition to the trade is most attractive; our advertising co-operation, a stimulus of sales.

THE HOWE MANUFACTURING COMPANY, Chicago, U. S. A.
Makers of the HOWE SEARCHLIGHT with the wonderful SPRING-CONTROLLED BRACKET